8 belts do a 10-belt job— 6 times as long

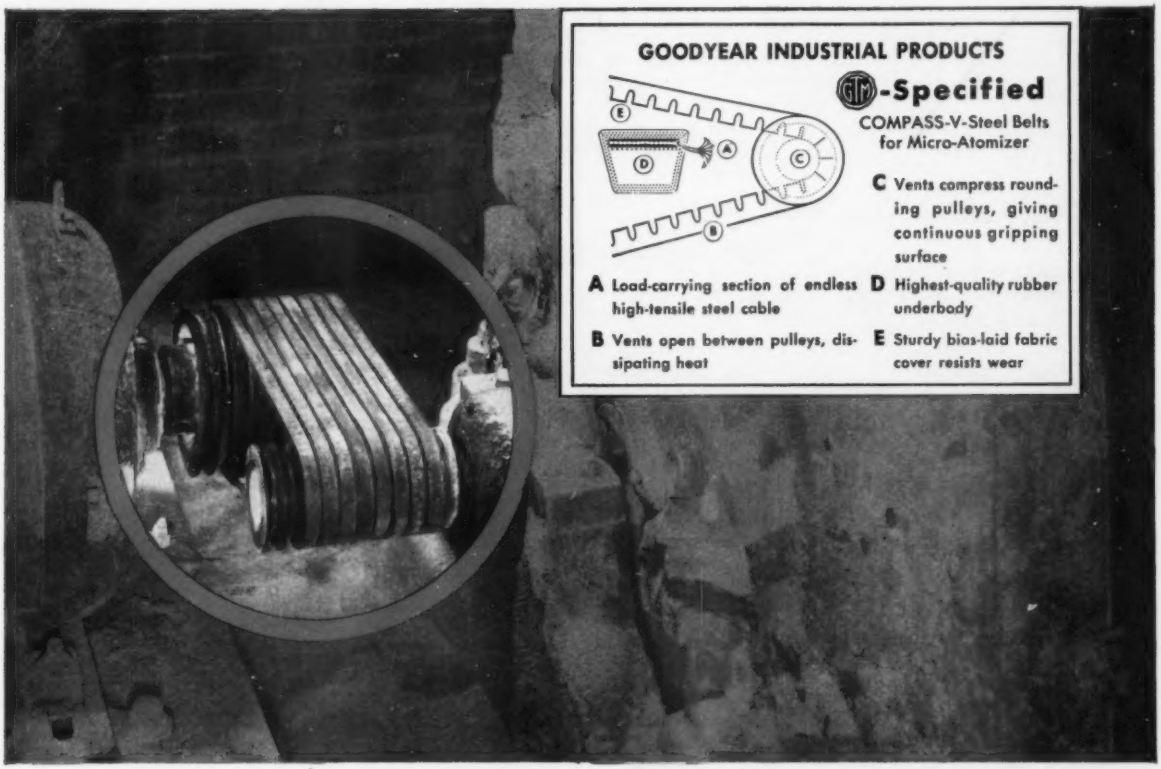
SMASHING chunks of nickel formate into small, dust-like particles is rugged business. What with the short-centered, dusty, 5,868 f.p.m. drives on their busy micro-atomizer, this Midwestern chemical plant was replacing whole sets of V-belts every 3 to 4 weeks.

Obviously, this heavy, month-after-month expense had to stop. Hopefully, they turned to the G.T.M.—Goodyear Technical Man. Confidently, he recommended COMPASS-V-Steel Belts with the Green Seal – built around airplane-type steel cable.

Thanks to this built-in strength, 8 of these super belts were able to handle what had always been a 10-belt job. And thanks to their unmatched toughness and dimensional stability, the G.T.M.'s belts had served a full 6 months at last report – looked good for at least 6 more.

And that's a typical experience. In countless belting jobs, COMPASS-V-Steel Belts with the Green Seal are giving longer service with fewer belts using smaller, less costly pulleys. Get the full moneysaving story from your Goodyear Distributor – or by writing Goodyear, Industrial Products Division, Lincoln 2, Nebraska, or Akron 16, Ohio.

IT'S SMART TO DO BUSINESS *with your Goodyear Distributor. He can give you fast, dependable service on V-Belts, Hose, Flat Belts and many other industrial rubber and non-rubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."*



V-BELTS WITH THE GREEN SEAL by

GOODYEAR

Green Seal, Compass—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

THE GREATEST NAME IN RUBBER

For more facts circle 502 on Reply Card

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'ROUND ABOUT

with the editors in field and office

Edited by R. L. Marinello

General Plant Engineer Appointed

John H. Miller has been appointed general plant engineer for the Heppenstall Company. His headquarters will be in the company's Pittsburgh office.

He started with the company in 1955 as chief engineer of the Indianapolis plant. Previously he had served as an engineer with the Taylor-Wilson Manufacturing Company, Pittsburgh.

Construction Briefs Booklet on Reinforced Concrete Available

FIFTH IN OUR series of Construction Briefs reprint booklets, a seven-article reprint of the "Designing in Reinforced Concrete" Briefs is now available.

The booklet contains those Briefs published during 1958 on the subject of reinforced concrete design procedures. Beginning with basic information on concrete and its mixtures, the articles discuss the theories of concrete-steel relations in reinforced concrete, then follow through the design of reinforced slabs, rectangular beams, T-beams, etc.

This seven-article booklet is available at a cost of 75 cents, from the Editor, PLANT ENGINEERING, 308 E. James St., Barrington, Illinois.

Material Handling Course

PLANT ENGINEERS confronted with material handling problems in moving their company's product will be interested in the annual Material Handling Training Course.

The dates for this year's course are June 14 to the 27. The place will be the Industrial Management Center, Lake Placid Club, Essex County, N. Y.

Some of the topics to be discussed on this year's program are: process, flow, and travel charts; plant layout and its relationship to material handling; plant surveys; organizing for

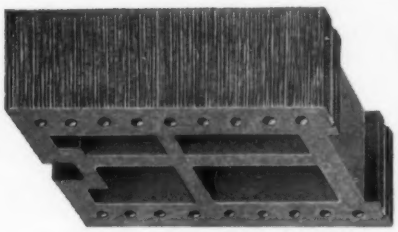
Plant Engineering Editor Sees the Light

Tom Hanson, Editor of Plant Engineering, recently attended a press preview, held in Cleveland, of General Electric's new Power-Groove fluorescent lamp. Art Barr, left, Manager of Application Engineering, GE, shows length of grooves in old lamp. Tom Hanson inspects smaller grooves in the new lamp.

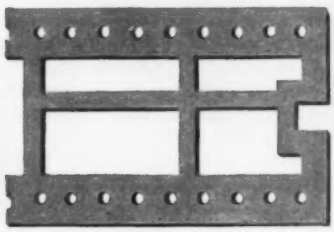
Subscriptions: U.S.A. $10, Canada $11. Other countries $12 per year. Single copies $1. Change of address: Send to PLANT ENGINEERING, Circulation Division, Barrington, Illinois. Please supply position title, company name, company address. Request must reach us by the 15th of month to make the change effective with following month's issue. Published monthly and accepted as controlled circulation publication at Chicago, Ill.

finished walls inside and out with ONE unit in ONE operation

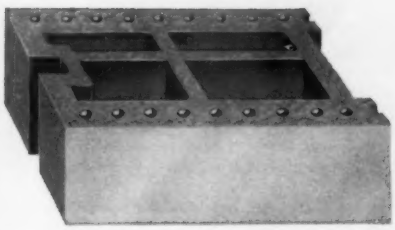
Natural Buff Rugg-tex exterior finish of the American Coils Company plant's outer walls is attractive yet extremely durable.



Tile Face Size: 3⅝" x 11⅝"



Tile Thickness: 7¾"



Attractive Ceramic Glaze interior finish brightens the office of the American Coils Co. plant in Freehold, N.J.

NATCO UNIWALL

is a structural clay load-bearing facing tile that provides single-unit wall construction finished on both inside *and* outside surfaces. Produced from quality hard-burned deaired fire clay in modular dimensions, UNIWALL offers many advantages to the builder:

- Easy handling, fast lay up.
- Permanent and fireproof.
- Small number of shapes required to provide complete finished walls and partitions—offers sizeable economies.
- Adaptable for either modular or non-modular construction.
- Selection of various interior ceramic glaze colors.
- Good insulation.

With allowance for ⅜" mortar joints, the nominal face dimensions of Uniwall tile are 4" x 12". Nominal wall thickness 8". Shape and construction details, design data and complete specifications are available in Natco Technical Bulletin UW 100-5. Please write for copy.

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CORPORATION

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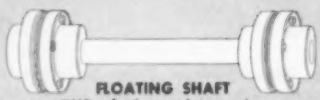
Thomas' 40 years of flexible coupling experience is at your disposal to help you meet ordinary applications or special variations for unusual cases.



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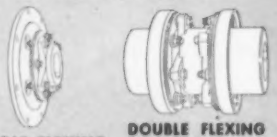
BMR — for heavy duty service with excessive misalignment



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SS — for engine-driven generator sets with out-board bearings

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UNDER LOAD and MISALIGNMENT ONLY THOMAS FLEXIBLE COUPLINGS OFFER ALL THESE ADVANTAGES.

1 Freedom from Backlash Torsional Rigidity
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'ROUND ABOUT

material handling; automation of material handling; communications and control; and a material handling training program.

If either you or one of your men is interested in attending, further information is available from James R. Bright, Director, Industrial Management Center, 56B Robbins Road, Lexington, Mass.

Chief Engineer Taylor

Paul Taylor was named chief engineer of the Gates Rubber Company, Denver, Colorado. In his new position, he will have management responsibility for machine and building design, maintenance, and building and machine development. Departments under his direction will include Engineering, Guards and nine different engineering shops—a total of 650 employees.

In 1946, he joined the Ohio Rubber Company in Willoughby as plant engineer and two years later he was made director of engineering. He worked in this capacity for four years. In 1952, he became director of engineering for Mansfield Tire and Rubber Company, Mansfield, Ohio, where he served four and a half years. Later he was made factory manager of the company's Oakland, Calif., plant. In 1958, he joined Gates Rubber Company as supervisor of mechanical development, which position he held until his present promotion.

Specs on Wooden Pallets

RECOMMENDED minimum specifications have been set down by the National Wooden Pallet Manufacturers Association for permanent types of wooden pallets made from Douglas fir, hemlock and larch species of lumber.

The specifications cover species of lumber, dimensions of pallet parts, tolerances, methods of fastenings and their applications and permissible and non-permissible defects. The new specifications do not apply to warehouse pallets made from hardwood species of lumber.

Copies of this standard may be obtained from local pallet suppliers or through the National Wooden Pallet Manufacturers Association, 609 Barr Building, Washington 6, D. C. Other pamphlets available from the same sources are the Technical Handbook on Pallets and Palletization, Expendable Pallets, and the Care and Maintenance of Wooden Pallets.

Underground Corrosion Course

PROGRAM FOR the 1959 short course, which will be held at West Virginia University, School of Mines, Morgantown, West Virginia, on June 2, 3 and 4, will cover the following:

Fundamentals of underground metallic corrosion and corrosion control practices as related to underground pipe and cable systems. Internal and external corrosion of metallic water systems and corrosion control measures. Also classes on coatings, covering corrosion control materials and material control practices, and special sessions on instrumentation, materials and test procedures.

Further information may be obtained by writing to the Appalachian Underground Corrosion Short Course, University of West Virginia, Morgantown, West Virginia.

New Appointments at Reserve Mining Company

Ray W. Anderson has been appointed superintendent of the mechanical maintenance department of the Babbitt Division of Reserve Mining Company, Babbitt, Minnesota.

Before coming to Reserve, he worked for a contractor in the building of both the Silver Bay and Babbitt portions of the taconite project. Prior to that time he had been a foreman with a manufacturer in Beloit, Wis., a marine company in Duluth, and a construction concern in Eau Claire.

He has served as assistant superintendent of mechanical maintenance at Babbitt before his promotion.

L. J. Molinaro has been appointed superintendent of the mechanical maintenance department of the Silver Bay Division of Reserve Mining Company, Silver Bay, Minnesota.

He has been assistant superintendent of the mechanical maintenance department at Silver Bay since 1955. A graduate of Denfeld High School, Duluth, in 1939, he became a machinist while serving in the U. S. Navy.

After leaving the service, he worked as a locomotive fireman, a stationary engineer, plumber and a supervisor for a construction company. In 1952, he was employed as an assistant superintendent by one of the contractors engaged in building the big taconite plant. After three years, and completion of the plant, he joined Reserve.

New addition to the line of Grinnell malleable iron hangers

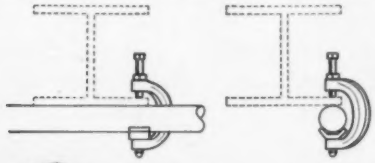
Grinnell's Malleable Iron G Clamp Hanger is a new addition to the line of Grinnell Pipe Hangers and Supports, the most complete line of any manufacturer. This hanger answers a long-felt need for support of pipe or conduit (up to 4 inches in size) where application can be made directly under structural steel.

The saddle of the Grinnell G Clamp swivels. This permits pipe or conduit to be installed either parallel or traverse to the beam axis. Separate beam clamp, rod and pipe clamp are not required, thus saving cost of supports and installation time.

Grinnell G Clamps are made of malleable iron with a ribbed design for added strength. The set screw has a hardened steel cup point for clamping rigidly to beam. Full thread engagement is provided by the tapping through the upper jaw. Approved by Factory Mutual Laboratories for use on fire protection and plumbing systems. Especially recommended for hanging conduit. Maximum recommended loads are from 210 to 450 pounds, for the smallest to the largest sizes, with a safety factor of 5.

Every Grinnell Malleable Iron Hanger offers . . .

- Safety factor of at least 5
- Thickness of metal increased at points of concentrated stress
- Homogenous metal composition throughout
- Extremely high resistance to impact and corrosion
- Economy



Saddle swivels, permitting suspension of the pipe or conduit at any angle in a plane parallel to the face of the supporting flange.

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AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

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pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
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ANOTHER IN A SERIES
OF MOTOR FACTS
FROM ALL INDUSTRIES

"Roughest duty we have ever seen motors endure"

reports Marquette Iron Mining Co. of the Westinghouse Life-Line A motors in its Eagle Mills Pelletizing Plant

Operating continuously, 24 hours per day, dependable Westinghouse Life-Line® "A" motors drive a network of fans and conveyors at the Eagle Mills Pelletizing Plant of Marquette Iron Mining Co., Ishpeming, Michigan.

Some of these motors are located directly above a sintering machine where ambient temperatures often exceed 200° F and the motor is subjected to deposits of finely divided iron ore. Under these conditions, not a single motor breakdown or failure has occurred during 11 months of service.

Says Mr. Ed Gagnon, plant electrician, "Our Westinghouse motors have given us complete reliability on the roughest tests we have ever seen a motor endure."

For specific information about the ways your operation can benefit from the improved performance, longer life and reduced maintenance offered by the dependable Life-Line "A," contact your nearby Westinghouse sales engineer. Or write to Westinghouse Electric Corporation, P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania. J-22077

YOU CAN BE SURE...IF IT'S
Westinghouse

Deposits of powdered iron ore are no problem to this 2-hp Life-Line "A" motor driving conveyor which carries powdered iron ore to the balling disc where ½" pellets are formed. Presealed, prelubricated Life-Line "A" bearings keep dirt and other material out.

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Lubrication

SPECIALLY TRAINED OPERATORS now machine "Teflon" to tolerances of .001" with Texaco Cleartex BX.

ANSWER TO "TEFLON" MACHINING PROBLEM FOUND BY THROWING OUT STANDARD CUTTING TECHNIQUES

DuPont's new thermoplastic, "Teflon" (or, more precisely, Polytetrafluoroethylene resin) has a combination of properties which makes it uniquely advantageous in a number of applications.

They also make it uniquely difficult to machine.

Unlike other thermoplastics, "Teflon" does not flow well in its melted state. This, plus the fact that the molding process requires extremely high temperatures, makes molding to close tolerances difficult. "Teflon" must be machined from rod stock when tolerance is a critical factor.

Special machining problems. Standard cutting techniques cannot be applied to "Teflon" machining, according to Mr. S. Mulay, President of Tri-Point Plastics, Inc., Albertson, N. Y. His firm, which specializes in working DuPont's new product, had to invent new cutting techniques and retrain operators to cope with "Teflon's" special characteristics. In spite of these steps, the materials–tools and lubricants–used in the machining process still gave Tri-Point trouble.

Cutting oil a critical factor. It soon became obvious that standard cutting oils used for ordinary metalworking were not adequate for "Teflon" machining. Although "Teflon" is not an abrasive material, its very low thermal conductivity coupled with its high heat resistance tended to shorten tool life by actually burning cutting edges. These high temperatures also warped the machined part, making close tolerances almost impossible. Finally, "Teflon's" white color made it extremely difficult to see the work through soluble oil emulsions–which otherwise might have solved the problem.

Tri-Point calls in Texaco. At this stage Tri-Point turned to the expert – a Texaco Lubrication Engineer. He outlined the need: a transparent cutting oil with the ability to remove the maximum amount of heat. After considerable study and testing, he recommended switching to Cleartex BX whose characteristics seemed precisely to fit the situation. His choice has proved to be right. Now Tri-Point uses this oil exclusively, with excellent results. Tool replacement has dropped significantly, and Tri-Point can count on maintaining "Teflon" tolerances of .001".

Pressure plus heat presents two-way lubrication problem

There is a definitely established trend today toward higher and higher temperatures in industrial processes in almost every type of industry. Mill rolls, plastic extruding machines and steam joints are only a few of the many applications which now involve temperatures well over 300° F. combined with high pressures. This combination has presented a severe lubrication problem – particularly in grease-lubricated equipment.

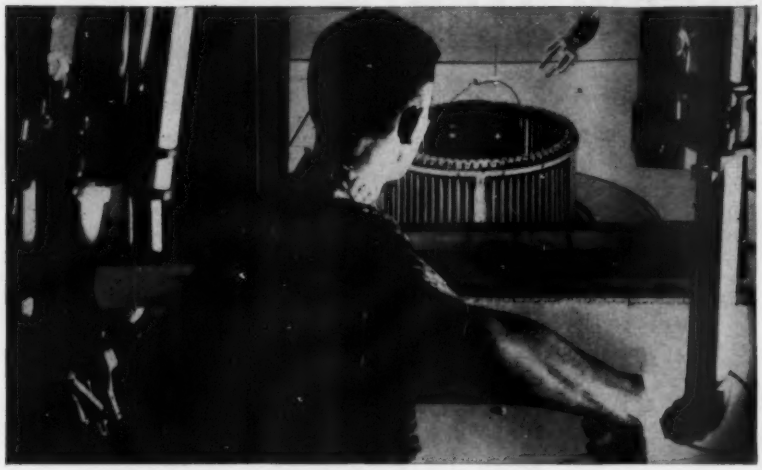
Nature of grease creates problem. As temperature rises, the consistency of grease decreases – most greases become virtually useless at temperatures above 350°. Furthermore, high heat will usually cause rapid oxidation and deterioration in a relatively short time.

Unique new grease resists both forces. Texaco has now developed a new product whose remarkable performance in two years of field tests seems to answer the problems of *both* high heat *and* extreme pressure–Thermatex EP-1.

Thermatex is unique in its high resistance to both these forces.

Protects 400° equipment for two years. Thermatex has been field-tested for two years as the lubricant for steam joints in a paper mill. Previous products used had solidified and coked after two weeks of exposure to the extreme pressures and 400° F. heat, causing failure of the joint. Thermatex, on the other hand, has kept the steam joints operating without failures–and without significant wear–for two years.

news



GAMMA-RAY "HOT CELL" AT BEACON contains radioactive Cobalt-60.

Nuclear energy harnessed to crack the secret of better lubricants

Lubricants finer than the ones available from even the most advanced standard refining techniques will soon be produced by Texaco—with the help of nuclear radiation. Completely *new* lubricants are a real possibility, too—lubricants with atomic structures stronger and more cohesive than anything now available.

To open up this new frontier in lubrication, Texaco has assembled the most fully equipped nuclear laboratory in American industry. Texaco scientists have been put in command of all four basic irradiation forces—electrons, positive ions, gamma rays and neutrons—and are now probing the activity of hydrocarbon molecules during refining.

In addition to the Cobalt-60—rated at 29,000 curies—Texaco scientists have at their disposal a 6- to 10-million electron volt linear accelerator and a 3-million electron volt positive-ion Van de Graaff generator. The linear accelerator, or "electron gun," was especially designed and built for Texaco and is probably the only nuclear instrument of its kind now in use by a commercial firm for its own fundamental research.

Searching analysis of deposit problems

The January 1959 issue of *Lubrication Magazine* is entirely devoted to deposit problems—their causes, prevention and solutions. This article should be of vital concern to every engineer who has to cope with this often-costly lubrication problem. See coupon.

MOVIE OF THE MONTH

★★ SEE! ★★

"HYDRAULICS"

"One of the year's most informative movies!"

—Paul Rolnick, Editor, *Applied Hydraulics*

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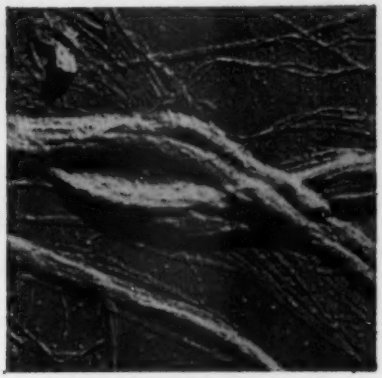
NEW PRODUCT NEWS

Nondrying protective coating keeps parts free from rust and corrosion for as long as a month during inter-process handling, storage, and shipment: *Texaco 564 Rustproof Oil.*

New, easy-to-apply gear lubricants won't drip in hot weather or flake off in cold—are ideal for many open-gear applications: *Texaco Geartac.*

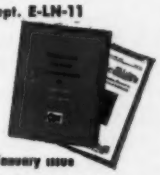


How working splits grease fibers.

80,000x electron microscope explores grease structures

One of the most important tools of research, the electron microscope, is helping in the development of new and better greases. By understanding the nature of grease structures and their reaction to various conditions, Texaco scientists can create greases that are suitable for many different purposes.

THE TEXAS COMPANY, Dept. E-LN-11
135 East 42nd Street
New York 17, New York



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☐ I am interested in seeing "HYDRAULICS"

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☐ Lubrication Magazine – January issue

☐ Management Practices that Control Costs via Organized Lubrication

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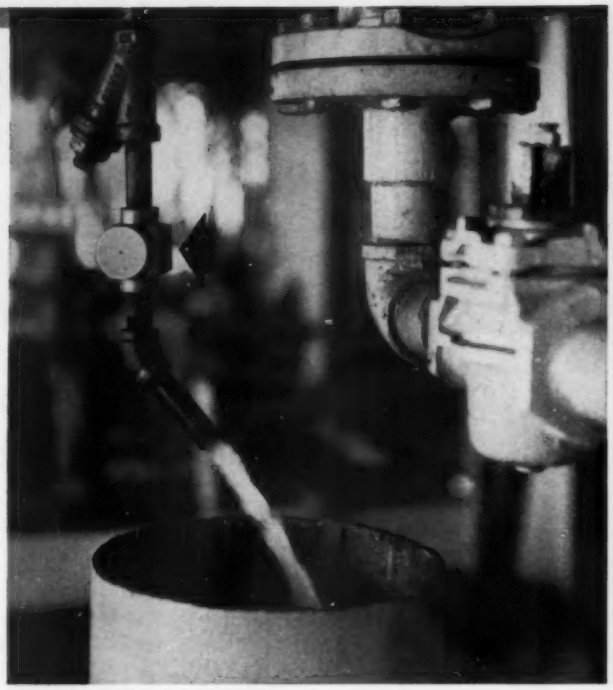
Here's a steam trap

..and for seven sound reasons:

1. *Simplicity* – only one moving part.
2. *Maintenance* – practically zero. 3. *One trap* for all pressures from 10 to 600 psi.
4. *Uniform performance* – operates equally well on heavy, light, or no condensate load.
5. Operates against *back pressures* up to 50% of inlet pressure. 6. *Rugged* – unaffected by superheat, water hammer, vibration, or corrosive condensate. 7. *Minimizes inventory* of spare parts.

Sarco TD's on outdoor blending tanks of Shell Oil Company, Sewaren, New Jersey, are installed vertically, instead of in the usual horizontal position, in order to drain coils after shut-down, thus preventing freezing.



1. DRAINS AND VENTS

at start-up. Immediately rids lines of condensate and air to permit normal operation. This eliminates the need for manual opening of valves to drain the system.

CONTROL COSTS

In these days of sharp emphasis on cost control, Sarco Thermo-Dynamic TD Traps are helping plants to deliver the full productive power of every pound of steam. And because the TD has no mechanism . . . no gaskets . . . no narrow channels to clog, maintenance cost on the TD is almost nil. As one plant engineer puts it: "This TD is a cinch to install, it's no bigger than a tee fitting, and it works in any position. The TD is the one steam trap we can install and forget."

CHOOSE THE RIGHT TRAP

There's an infinite variety of applications, temperatures, pressures and loads in industrial steam piping. Sarco can help you select the right trap for every job of air and condensate removal, saving you money and down-time.

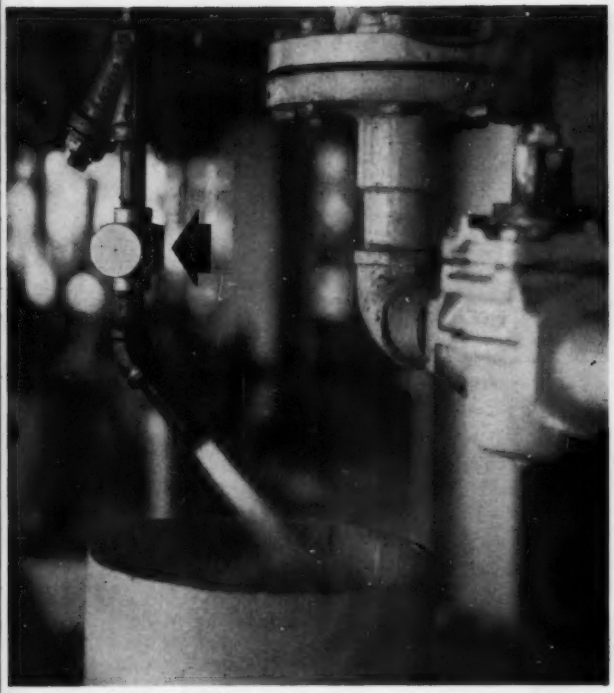
HOW ABOUT THE BUCKET TRAP?

With the development of the patented* Sarco Thermo-Dynamic Steam Trap, the bucket trap suddenly aged 50 years. In a nostalgic way we feel somewhat sorry, because *our* Sarco bucket trap has made us thousands of friends. But frankly, it's no match for the new Sarco TD. Progress is progress.

Some of our customers who are getting satisfactory service from our bucket traps may prefer to replace their old Sarco bucket traps with *new* Sarco bucket traps. If you feel this way, we're flattered enough to keep on making Sarco Bucket Traps – strong, sturdy and durable as ever. Let us suggest, however, that you at least give the new Sarco Thermo-Dynamic Steam Trap a try, under your most exacting conditions.

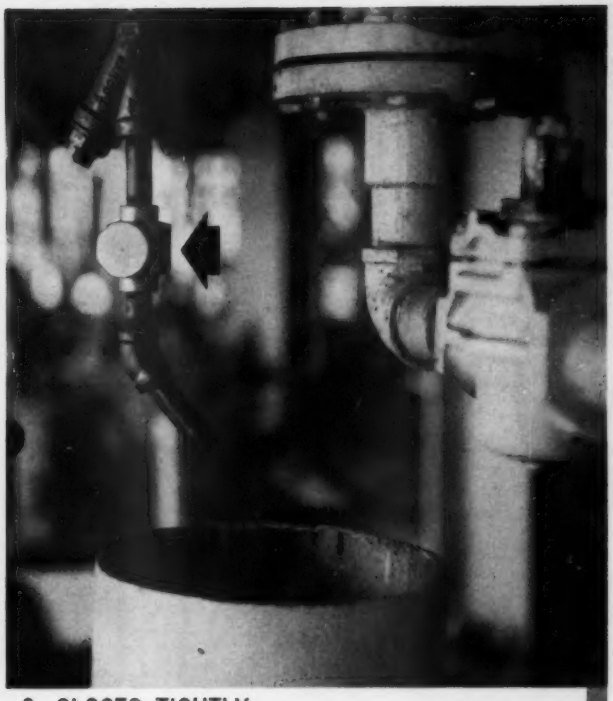
*U.S. Pat. No. 2,817,353 T. M. Reg. U. S. Pat. Off.

that does what a steam trap should



2. DISCHARGES

air and condensate at steam temperature as rapidly as they collect. Does not wait for a bucket of steam to leak through a small orifice.



3. CLOSES TIGHTLY

There is no continuous bleed; nor is there loss of buckets of steam as in the bucket trap which must discharge steam with each cycle.

MAINTENANCE TIME: 40 SECONDS!

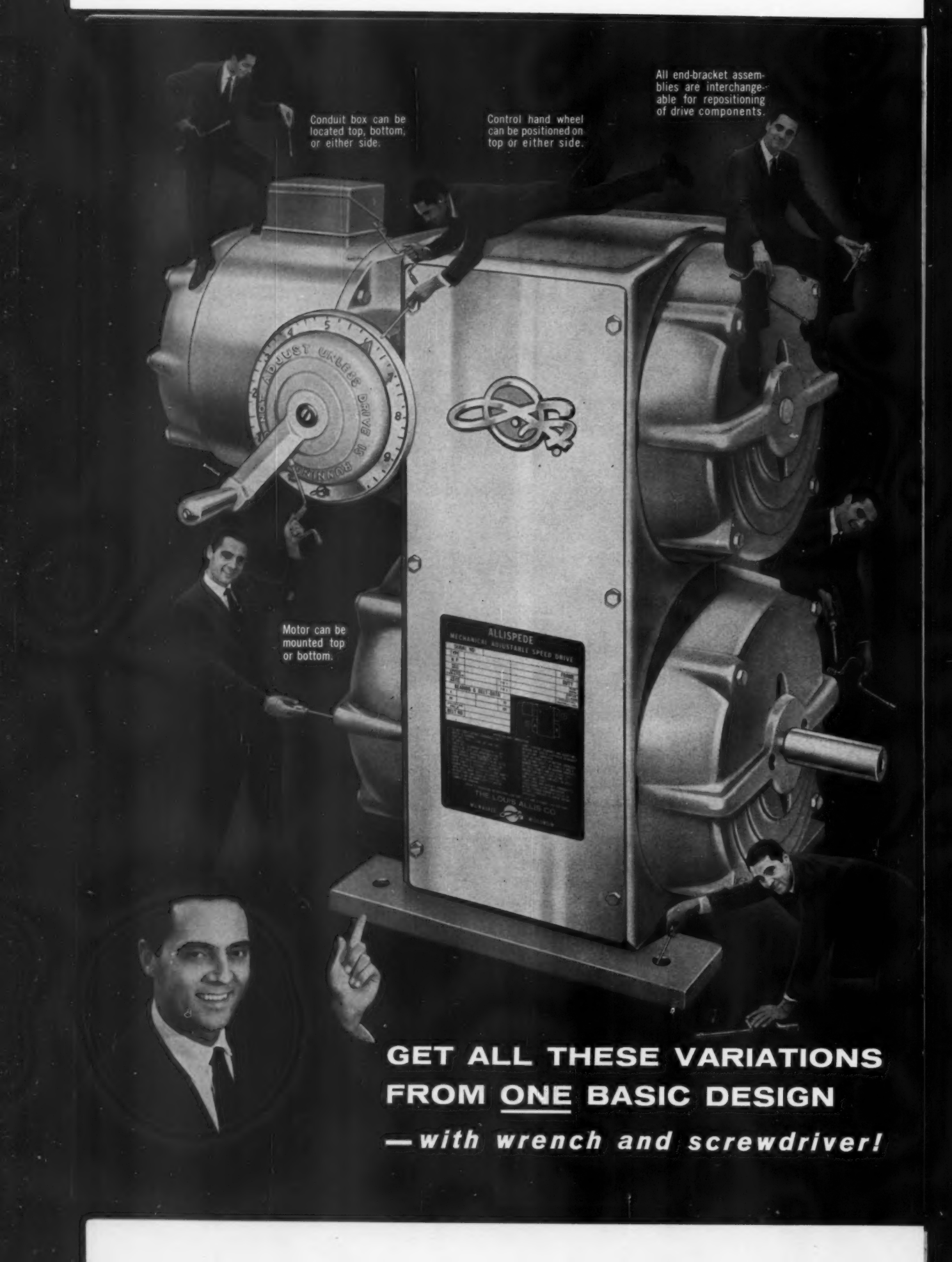
How long does it take your maintenance crew to service an ordinary trap? If it's over a couple of minutes, you're throwing away valuable time. The Sarco TD can be cleaned, blown out, if necessary, and reassembled on the line, in as little as 40 seconds. 6345-B

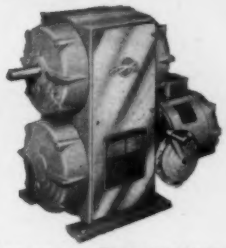
Sarco can give you impartial advice on trap selection because Sarco makes All—5 Types:
Thermo-Dynamic . . . Thermostatic . . . Liquid Expansion . . . Float Thermostatic . . . Camlift Bucket

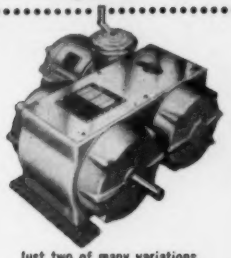
SARCO COMPANY, INC. 635 Madison Avenue, New York 22, N. Y.

STEAM TRAPS • TEMPERATURE CONTROLLERS • STRAINERS • HEATING SPECIALTIES

For more facts circle 508 on Reply Card


Conduit box can be located top, bottom, or either side.
Control hand wheel can be positioned on top or either side.
All end-bracket assemblies are interchangeable for repositioning of drive components.
Motor can be mounted top or bottom.
ALLISPEDE
MECHANICAL ADJUSTABLE SPEED DRIVE
THE LOUIS ALLIS CO.
GET ALL THESE VARIATIONS
FROM ONE BASIC DESIGN
—with wrench and screwdriver!





Just two of many variations that can be made from a standard ALLISPEDE DRIVE.

Another NEW product from Louis Allis

The ALLISPEDE* DRIVE gives you complete field versatility!

It's the most flexible and precise mechanical adjustable speed drive made—and the only one that can be fully adapted in the field!

The *all-new* ALLISPEDE DRIVE is the answer to any motor application that calls for low-cost adjustable speed. It permits smooth, easy speed adjustment — and maintains it exactly. Its modern design permits unusual field-flexibility — lets the user change the unit *any time* to suit his various requirements.

Output shaft can be high or low, right or left.

The a-c ALLISPEDE DRIVE is the *only* drive that can be fully adapted in the field by the user. The basic unit goes together like building blocks... feet, end brackets, control hand wheel, conduit box, and output shaft can be relocated in minutes to fit existing space limitations. The same unit can be changed from an upright to a horizontal drive for floor, wall or ceiling mounting. And all you need is a wrench and screwdriver!

Superior design improves drive efficiency and extends service life. The four bearings equally distribute belt load, increasing bearing and belt life. Movable discs slide smoothly on internally-lubricated splined shafts—won't stick in place or wear.

Detachable feet can be bolted to bottom, side, or top for floor, wall, or ceiling mounting.

Rugged cast-iron housing with plated steel covers shields drive against dirt and corrosion... integral rotor fan cools the motor and force-ventilates the drive housing to extend bearing life. Oversize cartridge bearings are pressed on shaft and lubricated at the factory. Corrosion-resistant stainless steel nameplates diagram proper motor connection, specify bearing sizes, and carry complete instructions for operation and lubrication.

The ALLISPEDE DRIVE can be supplied with in-line or right-angle integral gears, brake and tachometer. Sizes from 1 to 20 HP with speed variations up to 8:1. Electrical and mechanical modifications for any application.

Contact your Louis Allis District Office or Distributor for complete information and engineering assistance. Or write for Bulletin 3300, The Louis Allis Co., 434 East Stewart Street, Milwaukee 1, Wisconsin.

*ALLISPEDE is a trademark of The Louis Allis Co.

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

LOUIS ALLIS

For more facts circle 509 on Reply Card

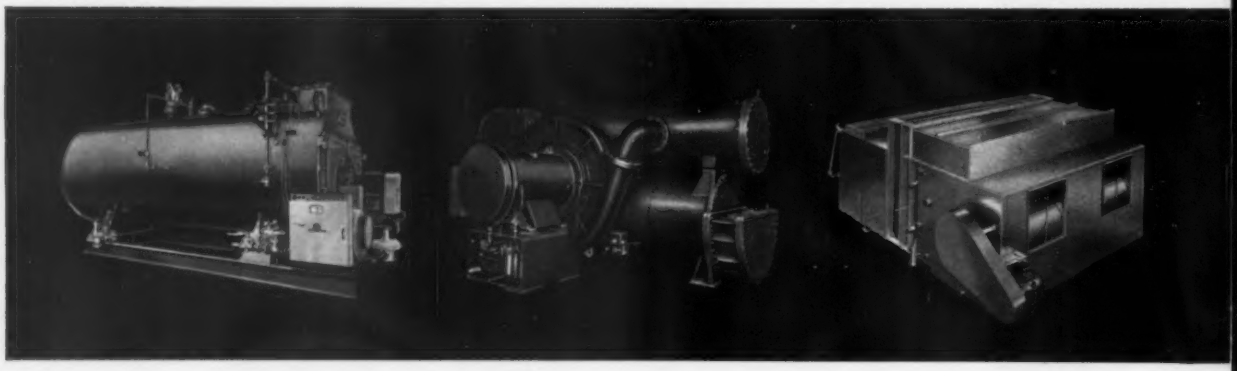
ASD-121

To serve you better we created a new division

Now you can benefit from the combined engineering backgrounds and product lines of three American-Standard* divisions—American Blower, Ross Heat Exchanger, and Kewanee Boiler—consolidated into *one* organization!

Here is *one-source* responsibility for quality and performance in equipment that is designed, engineered, and manufactured to work together. You draw from a product line unsurpassed in the industry . . . one that encompasses air conditioning, heating, ventilating, heat transfer, dust collection, and fluid drives.

There are engineer-staffed offices in all principal cities to work with architects, consulting engineers, and contractors with equipment selection and on-the-job problems. Send for Bulletin B-5829 for facts about the new: American-Standard Industrial Division, Detroit 32, Michigan. In Canada: American-Standard Products (Canada) Limited, Toronto, Ontario.



Firebox, scotchtype steel boilers and package units for heat, power, steam.

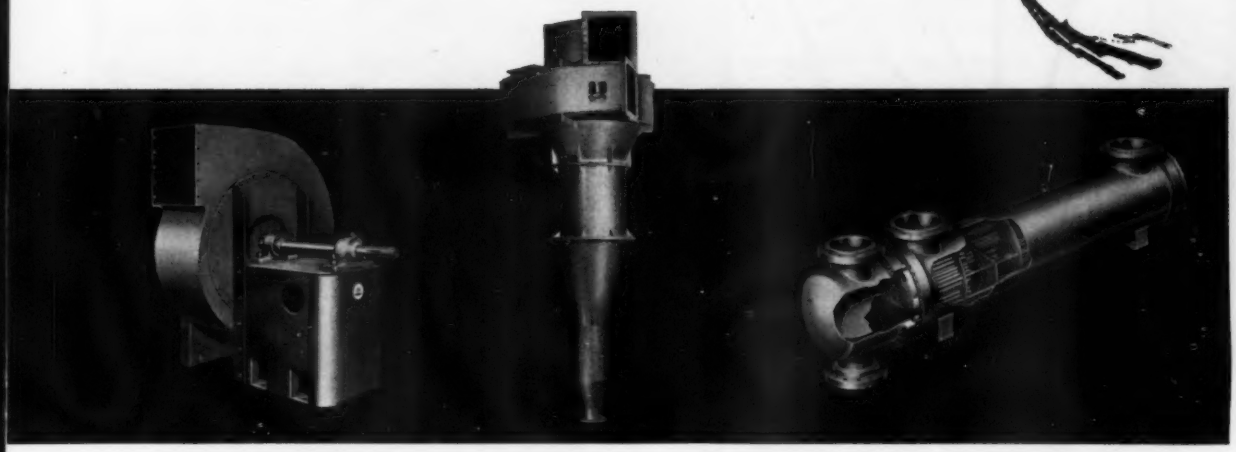
Centrifugal refrigerating machines for central-station air conditioning.

Central-station air-conditioning units for public buildings, industrial plants.

ONE CALL FOR ALL!

AMERICAN-Standard
INDUSTRIAL DIVISION

AMERICAN BLOWER • ROSS • KEWANEE



Industrial fans with wheel types for handling air, gases, materials, shavings.

Dust collectors for recovering valuable materials, eliminating nuisance dust.

Heat exchangers, condensers, and feedwater heaters for every requirement.

*AMERICAN-Standard and Standard® are trademarks of American Radiator & Standard Sanitary Corporation.

AMERICAN-Standard
INDUSTRIAL DIVISION

AMERICAN BLOWER PRODUCTS • ROSS PRODUCTS • KEWANEE PRODUCTS

For more facts circle 510 on Reply Card

WE WON'T HAVE ANY TROUBLE KEEPING THIS BEARING LUBRICATED— —THANKS TO DISTRIBUTOR DAN THE SKF BEARING MAN

"He recommended a centrally-lubricated spherical bearing," the mechanic told the foreman. "The lube goes directly to the rollers and races—and it flushes the old lube and dirt *away* from the bearing. When it comes to bearings, Distributor Dan sure knows all the answers."

Authorized SKF Distributors can help keep bearings running smoothly, longer, because they offer a complete bearings maintenance service. And they can promptly supply the bearings you need from their large, diversified stocks.

Why not find out exactly how the nearest Authorized SKF Distributor can help you? Ask him to call today. 5922

Spherical, Cylindrical, Ball, and "Tyson" Tapered Roller Bearings

EVERY TYPE—EVERY USE

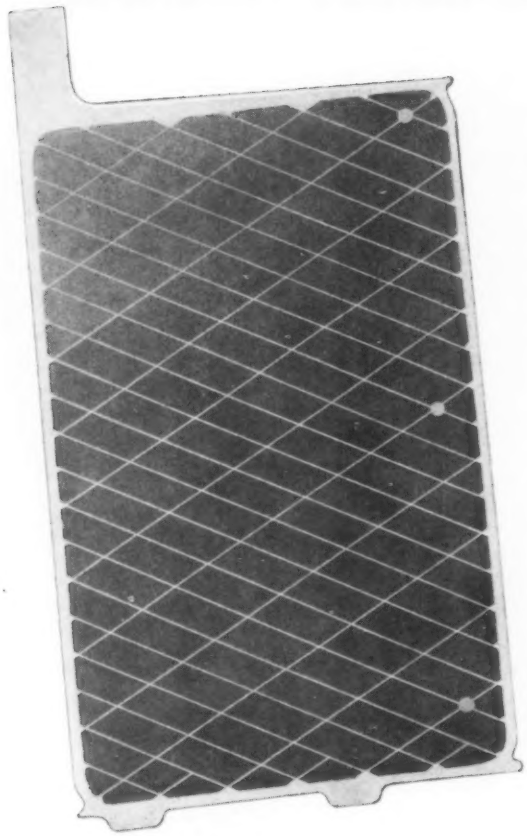
SKF®

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

*REG. U. S. PAT. OFF.

For more facts circle 511 on Reply Card

NEW GOULD *SILCONIC* PLATE Increases Battery Life 25%-FREE!



A vital contribution to motive power batteries, Gould's NEW Silconic Plate prevents grid corrosion, the most common cause of battery failure.

Sound, tested and proved, the principle is simply this: Gould introduces silver and cobalt into active materials of the positive plates. The silver and cobalt migrate to—and collect on—positive grid members, forming an insoluble oxide surface impervious to acid and oxygen attack. The longer the battery operates, the deeper the silver-cobalt penetrates into the grid metal, thus greatly prolonging life. In applications where batteries are idle for periods of time, Gould's Silconic Plate prevents migration of materials to the negative plate, effectively reducing self-discharge within the cell.

Further overall strength is achieved when arsenic is added to the antimonial alloy of the plate, resulting in an extremely dense, homogeneous grid free of flaws. This new physical and chemical strength—together with Gould's compact battery design—add up to the best motive power battery you can buy. Write today or call your local Gould representative. He's listed under "Batteries Industrial" in the yellow pages. Gould-National Batteries, Inc., Trenton 7, N. J.

More Power to you from **gould**

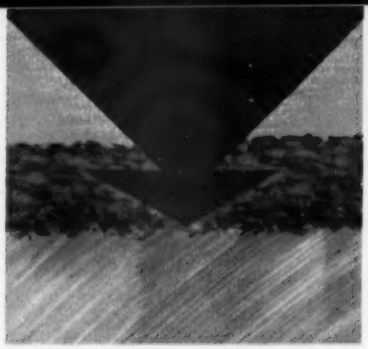
For more facts circle 512 on Reply Card

For more facts circle 513 on Reply Card →

You
the
RUST-OLEUM®
RUST PREVENTIVE
STOPS RUST!®
BEAUTIFIES AS IT

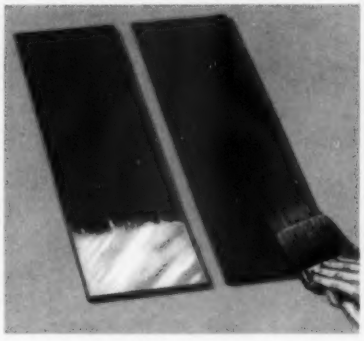
take brush!

Apply Rust-Oleum 769 Damp-Proof Red Primer directly over sound rusted surfaces. Saves costly surface preparations—lasts and lasts.



The **specially-processed** fish oil vehicle in the primer penetrates rust to bare metal—as proved in radioactive tracing studies.

Rust-Oleum, in its many forms, resists rain, fumes, heat, moisture, sun, and general weathering to stand up over the years.



Up to 30% more coverage with Rust-Oleum, depending upon the condition and porosity of the surface. Another Rust-Oleum difference.

See the many Rust-Oleum DIFFERENCES yourself!

Rust-Oleum primers and finish coatings are easily applied by spray. Flows smoothly . . . may be used in conventional, hot spray, or high pressure air-less spray.

A few easy strokes of the brush proves more than a thousand words . . . see how smoothly Rust-Oleum flows on . . . no pull, no drag . . . and it dries free of brushmarks. See, too, how much more coverage Rust-Oleum gives you . . . up to 30% more area depending upon the condition and porosity of the surface.

If your metal surfaces are *rusty* – simply brush or spray Rust-Oleum 769 Damp-Proof Red Primer right over the sound rusted metal after scraping and wirebrushing to remove rust scale and loose rust. The *specially-processed fish oil vehicle* in the primer penetrates rust to bare metal—driving out air and moisture. Easy as that to Stop Rust—and save time, money, and metal.

For *lasting beauty* – follow up with a Rust-Oleum finish coating in the color of your choice – from grays, greens, blacks, and aluminums to yellows, blues, whites, or browns – or from the many popular pastel shades.

That is the Rust-Oleum *System* of primer and finish coat for maximum over-the-years protection. A system that is measured by the money you save. Specify Rust-Oleum for maintenance, new construction, and re-modeling. Your Rust-Oleum Industrial Distributor maintains complete stocks for prompt delivery . . . he will be happy to consult with you on your coating problems.

What is your coating problem? What color do you need? Get lasting beauty in the color of your choice. Mail coupon for color charts.

SEE OUR CATALOG IN SWEET'S

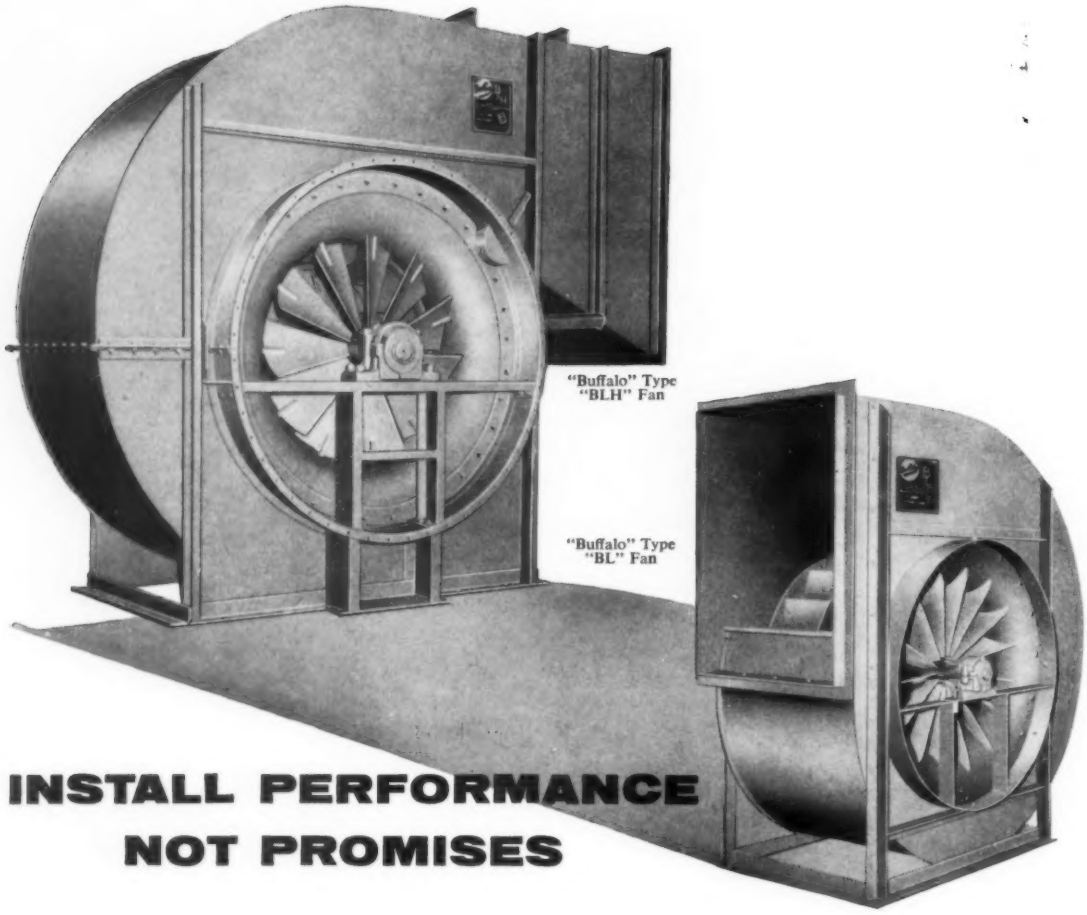
A matter of excellence.
Distinctive as your own fingerprint.

SEND FOR FREE TEST SAMPLE! ATTACH TO YOUR LETTERHEAD!

Rust-Oleum Corporation
2981 Oakton Street, Evanston, Illinois

Please send me the following at no cost or obligation:

- ☐ Free test sample of Rust-Oleum 769 Damp-Proof Red Primer for rusted metal surfaces.
- ☐ Complete literature with applications and color charts.
- ☐ Information on matching special colors.
- ☐ Thirty-page report on Rust-Oleum fish oil penetration.



INSTALL PERFORMANCE NOT PROMISES

Promised catalog ratings and actual on the job ratings are not always the same. When you install "Buffalo" Fans you can always be sure that fan *performance* will confirm your good judgment. Buffalo Forge Company's 81 year reputation for highest engineering and manufacturing standards is assurance that you will obtain fan performance to meet the *exact* requirements of each job.

FOR HIGH PRESSURE REQUIREMENTS:

Designed especially for Class III and IV construction, the "Buffalo" Type "BLH" fan will provide peak performance for your high pressure systems. It affords a mechanical efficiency of 86% over a wide range, while maintaining stability of performance from free delivery to shutoff. The "BLH" features a smooth inlet bell, directional inlet vanes, backward-curved blades and divergent outlet. These factors reduce turbulence to a minimum, and give very quiet operation. An added feature is the non-overloading characteristic. Bulletin F-201 gives complete details.

FOR MODERATE PRESSURE REQUIREMENTS:

The "Buffalo" Type "BL" Fan is an ideal choice for your Class I and II ventilating and air conditioning installations. Its high static efficiency over a broad range has been proved in hundreds of applications. The "BL" has many of the unique "Buffalo" features of the "BLH": it is non-overloading, and is designed for minimum turbulence and ultra-quiet operation. Other features are the factory-balanced wheel to minimize vibration and the wheel-contoured housing with large, correctly-shaped scroll. Write for Bulletin F-104.

Only "Buffalo" offers you the "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.

BUFFALO FORGE COMPANY
Buffalo, N. Y.
Buffalo Pumps Division • Buffalo, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING • AIR CLEANING • AIR TEMPERING • INDUCED DRAFT • EXHAUSTING
FORCED DRAFT • COOLING • HEATING • PRESSURE BLOWING

For more facts circle 514 on Reply Card

water treatment "weak links" can be boosting your operating costs

There are five important links in the ideal water treatment chain . . . five basic requirements for trouble-free water conditioning.

If any one is missing or functioning improperly, the entire steam-water cycle is affected leading to operating problems, efficiency losses and, sooner than necessary, costly downtime and repairs.

Dearborn engineers will survey your complete system from raw water to condensate return . . . uncover potential weak links . . . collect data for a precision water treatment program scientifically developed to meet your exact needs.

Such programs provide for continuing positive control . . . often result in substantial savings.

Write for Bulletin which tells why and gives details of Dearborn's unique Water Treatment Consulting Service.

DEARBORN CHEMICAL COMPANY

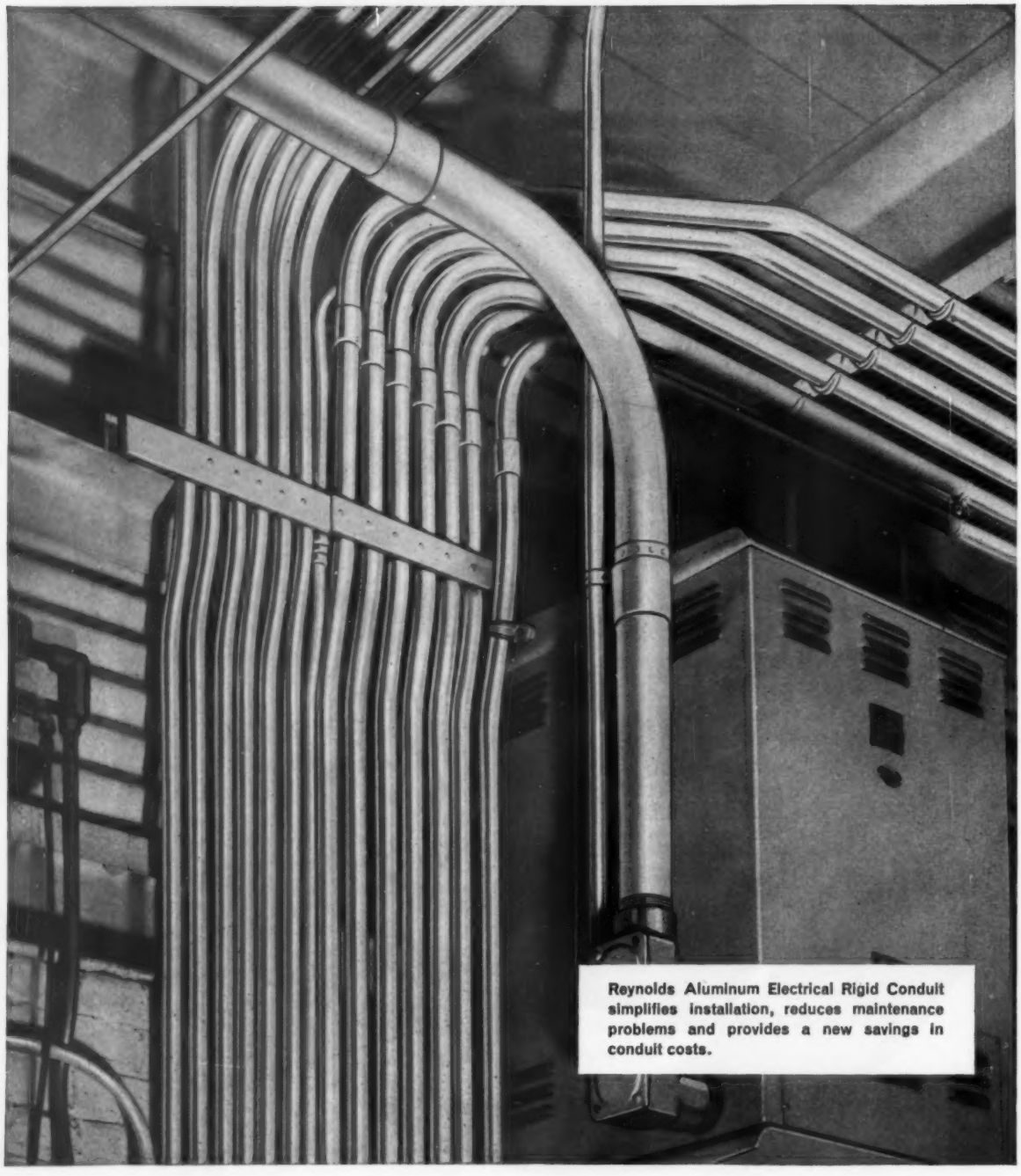
Executive Offices: Merchandise Mart, Chicago 54 • Plants and Laboratories: Chicago • Linden, N. J. • Los Angeles • Toronto • Havana • Buenos Aires

pioneer in the science of corrosion control

dearborn

For more facts circle 515 on Reply Card

cut your installation and REYNOLDS ALUMINUM



Reynolds Aluminum Electrical Rigid Conduit simplifies installation, reduces maintenance problems and provides a new savings in conduit costs.

maintenance costs with
ELECTRICAL RIGID CONDUIT

Lightweight! Non-Corrosive! Competitive in Cost!

Weighing ⅔ less than steel conduit, easy-to-handle Reynolds Aluminum Conduit cuts installation time and costs. Yet, Reynolds Aluminum Conduit is now more competitive with steel conduit in original cost! And aluminum can be used in so many ways, in so many places without the constant care steel requires. Imbed it in concrete, store it for long periods of time, expose it to weather—Reynolds Aluminum Conduit just cannot rust. Consider these benefits and the dollar savings they represent:

Light Weight
Let's take a concrete example. A 10-foot length of 3-inch aluminum conduit weighs just 27 pounds—in equivalent steel, 69 pounds! Reynolds Aluminum Conduit is easier to handle, so it's faster to install.

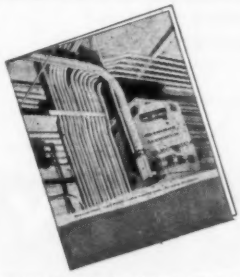
Corrosion-Resistant
Reynolds Aluminum Conduit is corrosion resistant to water, weather and most industrial atmospheres. There are no replacement worries due to rust . . . no periodic protective maintenance problems . . . no rust on walls or surrounding fixtures . . . no rusting of threads.

Non-Magnetic
Reynolds Aluminum Conduit is non-magnetic. Voltage drop is reduced—makes possible smaller conductors or longer runs in many cases.

Non-Sparking
Excellent for use in inflammable areas and atmospheres, Reynolds Aluminum Conduit won't spark from accidental contact blows from hard objects.

Easy Working
No special tools or installation equipment needed. Bending is easier too, because aluminum "sets"—less spring back. And, the interior surface is coated to make wire pulling easy.

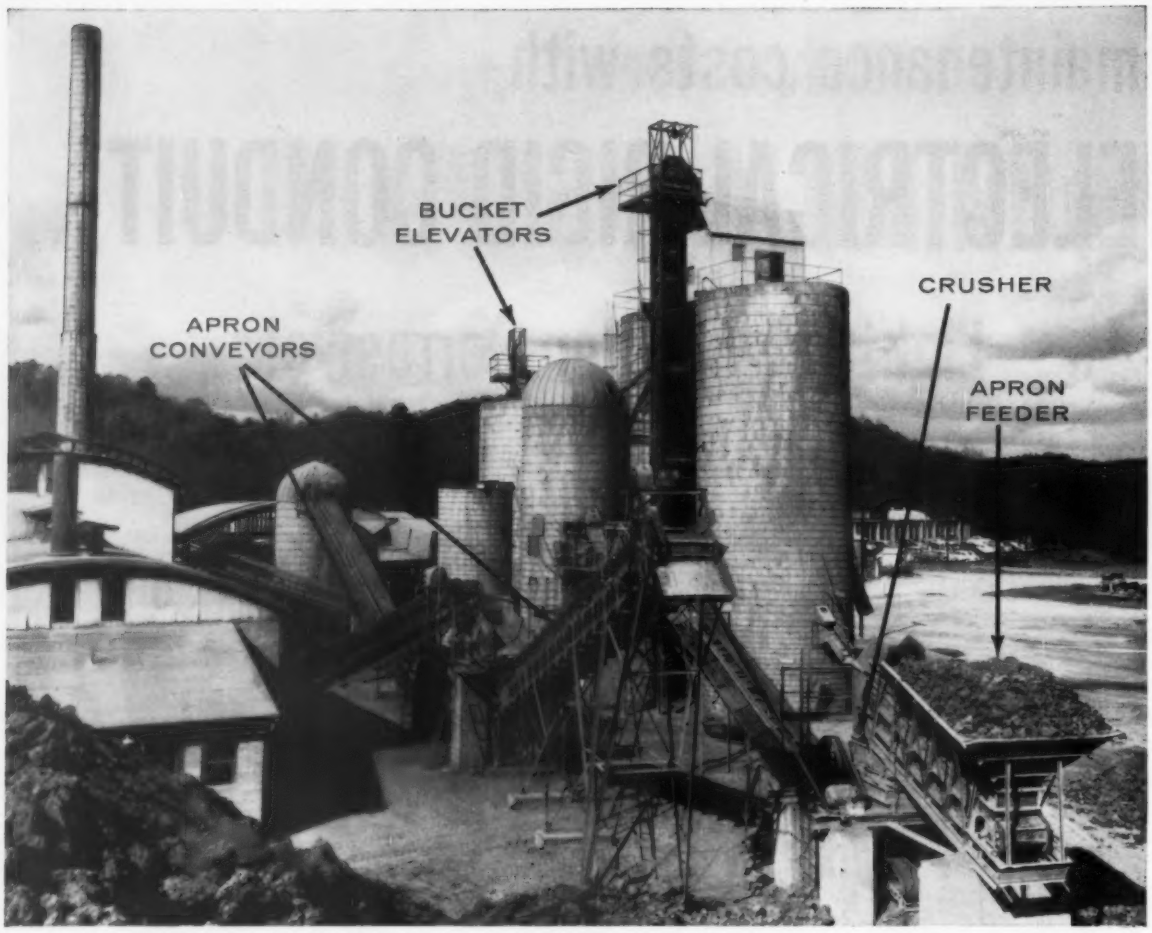
Watch Reynolds TV show—**"WALT DISNEY PRESENTS"**—every week on ABC-TV.



For more information and names of Reynolds Aluminum Electrical Rigid Conduit outlets, call your nearby Reynolds Sales Office or write *Reynolds Metals Company, Box 2346EQ-4, Richmond 18, Virginia.* Also write for descriptive brochure.

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

For more facts circle 516 on Reply Card



Still other Jeffrey equipment, not visible here, is contributing to the high efficiency of this concrete products plant.

Flexible standard units are engineered by **JEFFREY** to meet your special requirements

Whether you're modernizing an existing system or planning an entirely new plant layout, let Jeffrey engineers assist you. They'll recommend the combination of conveying and processing equipment giving you highest production at lowest possible cost. Jeffrey's long line of standard units permits almost endless combinations to meet special requirements.

For this help, and for catalogs containing complete information on Jeffrey equipment, write to The Jeffrey Manufacturing Company, Columbus 16, Ohio. Replacement parts available from Jeffrey authorized distributor stocks.

In addition to the units named, the following Jeffrey equipment is widely used in the aggregate, stone, sand and gravel, clay, phosphate and sulphur rock industries:

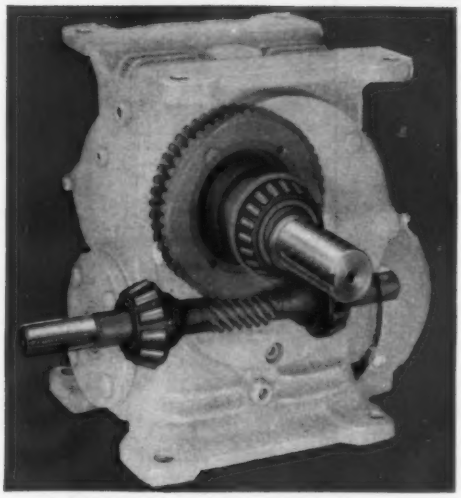
Scraper Conveyors • Spiral Conveyors • Pulverizers • Power Scoops • Car Pullers • Vibrating Conveyors • Magnetic Separators • Stackers • Batchers • Chains • Feeders • Grizzlies • WAYTROLS • Jigs.

CONVEYING • PROCESSING • MINING EQUIPMENT • TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

JEFFREY

For more facts circle 517 on Reply Card

NEW LINK-BELT
UNIVERSAL
worm gear speed reducers



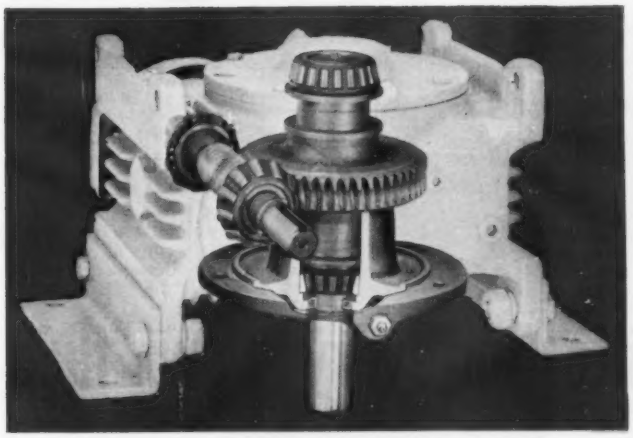
- *three mounting positions*
- *more hp per pound, per dollar*
- *available from stock*

IN *all* ways, Link-Belt's new *Universal* sets the pace among worm gear speed reducers. Its simple, compact design offers more usable hp in a smaller housing . . . holds down initial cost . . . minimizes mounting space. And with simple changes of oil gauge and breather, the *Universal's* versatile housing can be mounted in positions B, T, and V as shown.

The *Universal's* mounting versatility is matched by its performance versatility. It permits operation at high input speeds with fractional or large hp motors, provides moderate or slow output speeds with ample capacity for heavy loads, assures smooth transmission of power at right angles with high efficiency and minimum maintenance.

MOUNTING B — worm shaft below gear.

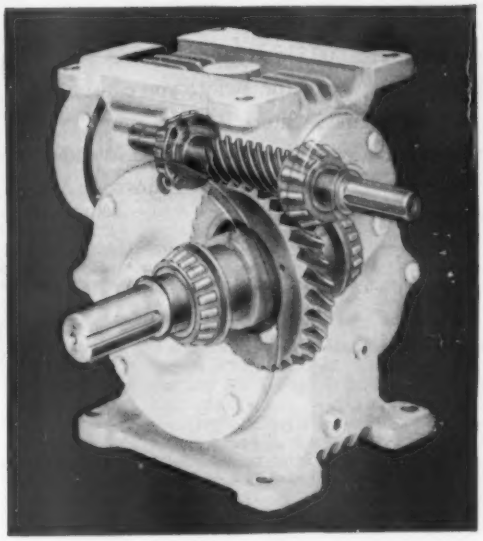
Universal worm gear speed reducers available in 2½, 3, 3½ and 4 inch centers with ratios of from 5⅛ to 60 to 1. For details, call your Link-Belt office or authorized stock-carrying distributor—see *SPEED REDUCERS* in the yellow pages of your phone directory. Or write for Folder 2724.



MOUNTING V — Output shaft vertical—upward or downward.

LINK-BELT

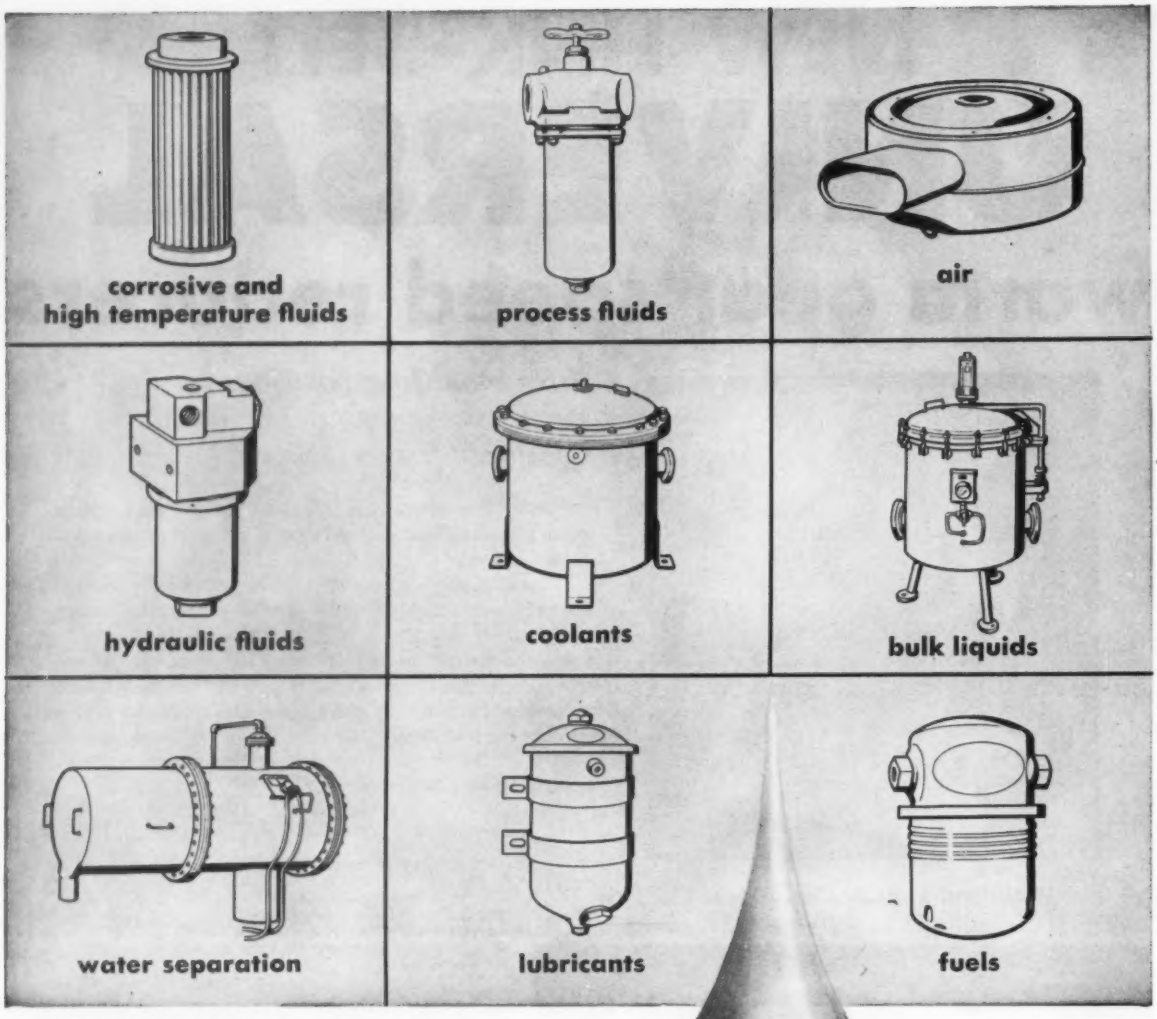
SPEED REDUCERS



MOUNTING T — worm shaft on top of gear.

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 15,018

For more facts circle 518 on Reply Card



There are over 2,000 filter types available right now from Purolator. Before you consider special, custom made filters, let Purolator know your filtration problem. Write Purolator Products, Inc., 970 New Brunswick Ave., Rahway, N. J., Dept. PA2-415.

There's a Purolator filter for every known fluid

Filtration For Every Known Fluid

PUROLATOR

PRODUCTS, INC.

Rahway, New Jersey and Toronto, Ontario, Canada
Agents in principal cities.

For more facts circle 519 on Reply Card

BULLETINS just released and of immediate plant interest

Reader Service Cards for ordering bulletins are on pages 249-250. Be sure to include your name, job title, and company, even if you want bulletins mailed to your home address.

INSTRUMENTS, CONTROLS

101 Instrumentation Literature—Bulletin G2-1a is a 22-pp index of literature on instrumentation, including product catalogs, specifications, technical bulletins, industry bulletins, systems bulletins, and instrumentation data sheets. Includes alphabetical subject-company index of Instrumentation magazine articles. Minneapolis-Honeywell Regulator Co.

102 Industrial Thermometers—Twelve-pp Catalog DT2-58 is filled with thermometer manufacturing facts plus detailed thermometer descriptions and specifications. Explains reasons for hermetic sealing, external recalibration and double dampening. Several new thermometers are shown. Rochester Mfg. Co.

103 Temperature Controllers—Specification S1010-6 describes electronic temperature controllers for industrial heating and cooling operations. A table of electrical ratings and switching actions is included, as well as dimensional diagrams. Minneapolis-Honeywell Regulator Co.

104 Pressure Transmitter—Bulletin WG-1824 Supplement A describes a differential pressure transmitter designed for controlling a distant indicator, controller, or other electrically operated receiver. Bulletin describes applications, operation, construction details, advantages, and operating specifications. Yarnall-Waring Co.

105 Feed Regulator Level Control—Basics in the control of feeders which are operated by electric motors or electric vibratory mechanisms, and the controlling equipment, are described in this 6-pp bulletin. Tells how the electronic feed controller works and how to install and start control. Industrial Instruments, Inc.

106 Manometry Explained—Theory and application of manometers is covered in this 6-pp bulletin. Principles and terminology of manometry are explained, different types of manometers are described, and a number of manometer applications with working diagrams are presented. Dynametrics Corp.

107 Manometer Data—Featured in this 12-pp bulletin is a line of manometers, including well type, raised well type, sliding scale U-tube, absolute pressure, and U-tube types. Tables of design data and other engineering details included. Trimount Instrument Co.

108 pH Recorder—Described in Product Specifications E12-4, E67-5 and E67-6 is a pH recorder consisting of electrode assembly and amplifier and a potentiometer recorder. Charts, tables, and drawings are used to aid in the proper selection according to application. Bailey Meter Co.

109 Electronic Controller—Specification Sheet GE-60001 describes an electronic temperature controller for electric heat treating furnaces and other applications. Features and operation discussed in detail. Hagan Chemicals & Controls, Inc.

110 Calibration System—This 16-pp publication tells how to calibrate newest types of process control systems. Emphasizes testing and calibration of control systems using proportional currents for signal transmissions and telemetering. Electrical and mechanical specifications for three calibration instruments are included. Technique Associates, Inc.

LUBRICATION

111 Solid Lubricants—Described in 12-pp Bulletin 15 is a line of specialized lubricants, featuring high temperature, water resistant, extreme pressure, anti-seizing solid lubricant compounds. Among types covered are greases fortified with molybdenum disulfide, or graphite, oil dispersions of molybdenum disulfide or graphite, solid dry film lubricants and others. McGee Chemical Co., Inc.

112 Bearing Lubrication—Reprint 5810 is a 26-pp manual on lubrication of miniature instrument bearings. It supplies data and information on types and brands of oils and greases available, and deals with oil and grease lubrication, properties of lubricating oils and greases, specifications, standard, and special lubricants. Miniature Precision Bearings, Inc.

PUMPS, PUMPING

113 General Purpose Pumps—Described in 18-pp Bulletin B-1300 are horizontal centrifugal pumps capable of handling water and other non-abrasive liquids in quantities up to 70,000 gpm. Cutaway sectional views and cross-section drawings illustrate details of design and construction. Tables of dimensional and performance data. Peerless Pump Div., Food Machinery and Chemical Corp.

114 Controlled Volume Pumps—Bulletin 1257 describes company's miniPumps for metering chemicals in minute volumes against pressures. Contains complete specifications on laboratory, industrial and chromatographic designs. Milton Roy Co.

115 Fire Pumps—Described in Bulletins 08B8551 and 08B9032 are fire and low pressure (booster) pumps — centrifugal double-suction, single-stage units for heads from 50 to 145 psi, capacities from 500 to 2500 gpm. Literature provides pump specifications, fire fitting arrangements, hose header locations, nozzle dimensions and selection chart. Allis-Chalmers Mfg. Co.

116 Dry Chemical Feeder—Volumetric extrusion type dry chemical feeders are described in 16-pp Bulletin 215. Discusses construction and operation of the feeders, and includes dimensional planographs, list of ranges of feeds, general technical data, and graphs. Infilco Inc.

GASKETS, SEALS

117 O-Ring Data—Design and application of "O" rings for dynamic sealing and static gasketing is subject of 20-pp Bulletin AD-148. Discusses materials of construction, dynamic and static applications, use of back-up or non-extrusion rings, and groove design for this style of packing. Dimensional data tables are included, as well as drawings, diagrams. The Garlock Packing Co.

118 Too Hot to Handle?—Described in illustrated Catalog 480 is a circulating seal designed to reduce temperature of liquid in stuffing box. Cutaway view and diagram illustrate design and construction features of the circulating ring which provides circulation of liquids to maintain temperatures. Durametallic Corp.

MECHANICAL POWER TRANSMISSION

119 Variable-Speed Drives—Bulletin G-5812, 8-pp, describes drives for infinitely adjustable output speeds from a constant rpm motor source operating from standard in-plant a-c circuits. Gives construction features, condensed drive specifications, available speed variations and accessories etc. Reeves Pulley Co., Div., Reliance Electric and Engineering Co.

120 Worm Gear Drive—Bulletin 3050 offers engineering information on right angle gearmotors, in ratings of ⅓ to 30 hp, single reduction, with output speeds of 23 to 280 rpm. Cutaway view showing component features, as well as specifications and dimensional diagrams are included. The Louis Allis Co.

122 Compact V-Belt Drives—Bulletin A-695 contains 44-pp of information on Dyna-V drives, 1 to 1500 hp, featuring compactness, and economy. Illustrated with photos and engineering drawings, bulletin explains construction features and advantages, and includes tables of pre-engineered drives and other tables giving horsepower capacities, belt speeds, center distances, sheave diameters. Dodge Mfg. Corp.

123 On V-Belt Drives—"The Modern Way To Design V-Belt Drives," 32-pp, provides drive design information on company's Super HC V-Belt

BULLETINS

(Begins on page 27)

drives. Drive tables, featuring a complete range of sheave diameters and belt lengths, show how to handle stock and non-stock drives. Includes section on analyzing service level of the drive, as well as specifications. The Gates Rubber Co.

124 Belt Saver Pulleys—Bulletin 35-D describes advantages of company's line of belt saver pulleys designed to increase conveyor belt life. Tables of dimensional data included. Sprout, Waldron & Co., Inc.

125 Variable Speed Pulleys—Twelve-pp Bulletin 4101 describes variable-speed pulleys designed to eliminate freezing and sticking. Gives technical data on five sheaves designed for ratings of 2 to 15 hp, and includes photos and drawings showing construction features. T. B. Wood's Sons Co.

126 Variable Speed Belt—This 12-pp bulletin contains an alphabetical listing by make and model of variable speed units, and an interchange guide with other makes of belts. Conversion table and numerical listing, and list prices are also included. Browning Mfg. Co.

FANS

127 Mechanical Draft Fans—Bulletin FD-905, 28-pp, describes mechanical draft and other heavy-duty fans for a variety of industrial applications. Includes basic data for proper fan selection, performance tables, design sketches, component and installation photos of many types from kiln fans to cyclone compressors. Buffalo Forge Co.

128 Induced Draft Fan—Bulletin L-1A describes features and capabilities of induced draft fans designed to reduce stack maintenance costs while improving combustion in hand- or mechanically-fired boilers. Schematic drawings, dimensional diagrams and photos are included. Lehigh Fan & Blower Div., Fuller Co.

CONSTRUCTION

129 Construction Data—This handy 160-pp, pocket size 1959 Construction Data Handbook devotes over 40 pp to tables and charts for estimating building material requirements. Also included are mensuration tables, construction details and authentic data on painting and concrete work. Products for protection, preservation and decoration of concrete, metal and wood are described together with their uses, coverage. A. C. Horn Companies, Div. Sun Chemical Corp.

130 Curtain Walls—Construction and design information on curtain wall systems for all building types is presented in this 12-pp bulletin. Discusses three series of curtain walls adaptable to all architectural treatments. Photos of typical installations are included, as well as specifications. Typical sections are diagrammed. Albro Metal Products Corp.

131 Aluminum Grating—Featured in this 8-pp bulletin is a line of aluminum grating designed for a variety of industrial applications. Safe load tables and dimensional data and diagrams are included. Kerrigan Iron Works, Inc.

132 Safety Grating—Steel, aluminum and stainless steel safety grating for a variety of industrial applications is featured in illustrated 24-pp Catalog 5911. Shows typical installations, and includes complete engineering data for erection, as well as detailed load charts and specifications. The Globe Co.

133 Industrial Doors—This literature file contains detailed descriptions and specifications on company's line of industrial doors. Features and engineering details are illustrated and described, as well as materials of construction, operation, and installation, and specifications included. Crawford Door Co.

134 Non-Ferrous Railings—Presented in 24-pp Bulletin 911 are stock components for fabrication and assembly of non-ferrous hand railings. Covering aluminum, bronze, stainless steel and plastic components, it contains detail drawings and specifications. Of special interest are sections devoted to Carlstadt railing system, designed around an adjustable handrail bracket, and Colorail, a colorfast plastic handrail moulding. Julius Blum & Co.

135 Fence Products—This 42-pp general catalog lists fence and kindred products for a variety of applications. In addition to describing numerous types of fences and posts, contains information and specifications on barbed wire, fence stretchers and splicers, fence tools, gates, hardware cloth, roofing sheets, wire fabric. U. S. Steel Corp.

STORAGE EQUIPMENT

136 Rack Reference Library—Included in this storage rack reference file library is a 24-pp course of instruction on rack design and construction, together with individual case histories showing solutions to storage problems. Literature also provides beam load capacities of standard I-beams, channel and pipe. Tube-Strut Corp.

137 Live Storage Racks—Gravity type racks for live storage and order picking applications are described in Bulletin R-100. Advantages are detailed, and typical installations are illustrated. Lamson Corp.

MATERIALS HANDLING

138 Overhead Conveyor—This 12-pp catalog contains latest information about company's overhead conveyor systems designed to meet a variety of industrial needs. Describes typical installations and includes layouts, together with complete engineering specifications. Chainveyor Corp.

139 Vibrating Conveyors—Advantages and features of vibrating conveyors are detailed in 16-pp Catalog 66. Layouts and flow charts showing how conveyors can be designed to perform a wide variety of processing operations at the same time the material is being conveyed are included. Ajax Flexible Coupling Co., Inc.

140 Heavy-Duty Trailers—Eight-pp Catalog B describes design and construction of heavy-duty custom-built trailers for industrial yard and plant service. Illustrates types of running gear, tires, frame and platform construction, and other details. Easton Car & Construction Co.

141 Cable Reels—Bulletin RL 258 describes construction, uses and features of constant duty Type RL cable reels for lifting or supporting extra-flexible type rubber jacketed cords for an uninterrupted power supply. Gives technical data with specification drawings and dimensional tables. Appleton Electric Co.

On pages 249-250 are two postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in ads.

HEATING, COOLING

142 Improved Heating Coils—Bulletin PD1, 8 pp, introduces Multi-Zone Platecoil designed for higher operating pressures and faster heat up. High BTU transfer, light weight, safety, easier cleaning and other advantages stressed. Use of Multi-Zone Platecoil in open and closed tanks, and in other applications detailed. Dimensional data included. Platecoil Div., Tranter Mfg., Inc.

143 Zone Control Cabinets—Air conditioning zone control cabinets are described and illustrated in 20-pp Bulletin AC-220. Separate sections with tables, curves and sketches cover proper unit selection, physical data, dimensions, fan performance and coil ratings for water cooling, direct expansion, hot water and steam. Buffalo Forge Co.

144 Packaged Chillers—Sixteen-pp Bulletin 8325 describes redesigned packaged water chillers for air conditioning and industrial cooling applications. Outlines advantages of the units and illustrates mechanical specifications. Schematic wiring diagrams show control panel wiring, control circuit wiring. Also shown are pneumatic control connections. Selection data covers full range of sizes. Industrial Div., American-Standard.

(More Bulletins on page 251)

let's take a second look at air compressor costs

Let's look at what Joy compressors have to offer in saving you money where it counts the most. Let's assume that all compressors are competitively priced . . . and go on from there.

eagle-eye the installation first . . . here's where specifying Joy saves a bundle. Why? Because Joy stationary compressors are "Packaged" units. They're shipped complete, ready to run without tedious, costly site assembly. Joy compressors need as little as one-half as much foundation. You can save up to $1000 on that item alone.

plus savings in maintenance . . . *All the wearing parts:* the cylinder liners, cross head guides, valves, etc., are replaceable at your plant, by your men. This is a Joy exclusive. No specialists needed, no fancy tools required. Joy engineered these compressors to run for years on minimum maintenance.

and on operation, we'll let the people who have used Joy compressors for years do our telling for us. Nope—no modesty . . . but the money they've saved in operating costs annually would sound unbelievable coming from us.

If you're frowning over the choice of your next compressors and what to do to save a needed buck . . . . . .

Take a second look and get in touch with a Joy Engineer. He'll show you how Joy saves you money on air. Write Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa. In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.

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WRITE FOR FREE BULLETIN 243-15

JOY SAVES YOU MONEY ON AIR

COMPRESSORS • FANS • DUST COLLECTORS

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NEW 2-SPEED SKIL

BLADE LIFE DOUBLED. Shoe can be repositioned easily with screw driver to use new cutting area of blade after one part is worn. Actually doubles blade life.

CUTS CLOSE to walls—right or left side, up or down, because of off-center blade location, reversible blade.

RECIPRO SAW

CUTS MAINTENANCE, LABOR COSTS... REPLACES TEDIOUS HAND SAWING

The new SKIL 2-speed Recipro Saw is an entirely new concept in reciprocating saw design. It cuts anything that can be sawed by hand—faster, easier and better. Does the work of keyhole, hack and hand saws 5 to 20 times quicker. It's another major development in the design of power tools by the originators of the famous SKIL SAW.

New 2-speed feature obsoletes all other reciprocating saws. Low speed cuts metal fast with minimum blade wear; high speed makes fastest cuts in wood and compositions. No single compromise speed. And SKIL makes a complete line of 20 Recipro Saw blades to cut virtually any material. It means the right speed plus the right blade for every job.

New off-center blade location allows cutting really close to walls and in tight places where only hand tools could be used before. Another plus is the reversible blade which lets you make close cuts up or down, as well as at the right or left side. And the convenient top handle is removable.

New savings in blade costs alone quickly pay for this new saw—because the new 2-position shoe actually doubles blade life! When one blade section is worn, you just reposition the shoe and cut with a new, unused blade section.

New low maintenance mechanism has only 3 main moving parts. And *all* parts subject to wear are heat-treated alloy steel. All ball-bearings throughout.

New in idea, new in design, new in efficiency —the all-new SKIL Recipro Saw is the most versatile, most universal portable cutting tool ever made.

SKIL

Famous SKIL and SKILSAW products made only by SKIL Corporation, 5033 Elston Avenue, Chicago 30, Illinois. In Canada: 2601 Dundas Street West, Toronto 9, Ontario.

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A REPORT TO MANAGEMENT ON HOW

Industry cuts costs with FIR PLYWOOD

ROUTE TO:

- ☐ ENGINEERING
- ☐ PRODUCTION
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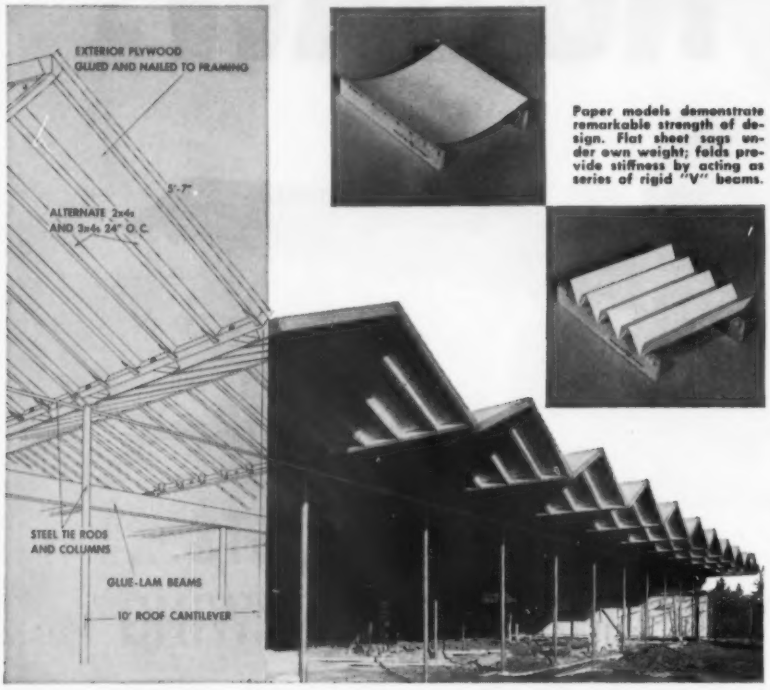
- ☐ CONSTRUCTION
- ☐ _____


EXTERIOR PLYWOOD GLUED AND NAILED TO FRAMING
5'-7"
ALTERNATE 2x4s AND 3x6s 24" O.C.
STEEL TIE RODS AND COLUMNS
GLUE-LAM BEAMS
10' ROOF CANTILEVER

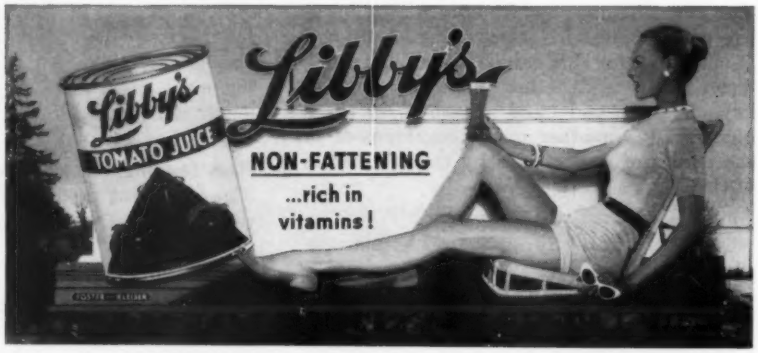
Paper models demonstrate remarkable strength of design. Flat sheet sags under own weight; folds provide stiffness by acting as series of rigid "V" beams.

Strength from shape—not mass—is the key to this precisely engineered fir plywood folded plate roof. The plywood plates are stiffened with light lumber framing and act in pairs to form a series of giant "V" beams.

Stronger, yet less expensive (by 20 per cent or more) than conventional joist or truss construction, fir plywood folded plate roofs are ideal for warehouses, stores or other buildings that require large, clear floor areas. Depending on design, the system permits clear spans of 50 feet or more.

In the 14,000 sq. ft. shopping center shown here under construction, plywood roof components were fabricated on the ground using common labor, and installed by a 6-man crew in less than nine hours. In-place cost came to less than 80c per square foot.

Delicate electronic equipment, produced by Edgerton, Germeshausen & Grier, Inc., Boston, is shipped to AEC test sites in Eniwetok in light yet rugged fir plywood containers that provide maximum protection at low cost.



Giant overlaid plywood cut-outs add real impact to outdoor advertising. This giant bulletin produced by Foster & Kleiser, San Francisco, for Libby's is being rotated in key West Coast markets. The plywood cut-outs are light, strong, and easy to fabricate. The medium density resin-fiber overlay is fused to the panel during manufacture to form a smooth, durable surface for quality paint finishes. The overlay is completely waterproof and has a slight "tooth" for better paint adhesion.

FOR MORE INFORMATION about fir plywood—its uses, properties and advantages—write

DOUGLAS FIR PLYWOOD ASSOCIATION

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Why Insul-Mastic costs less than ordinary asphalt coatings . . .

THERE are several ways to measure the cost of a protective coating. But the only *true* way is by measuring its *performance*. And performance is determined largely by the materials that go into a coating.

Insul-Mastic is sometimes considered an asphalt-type coating. But, unlike ordinary asphalt coatings, Insul-Mastic contains special materials which resist corrosion and wear far longer and better than straight asphalt coatings.

These materials include:

1. ***Large Amounts of Gilsonite*—the natural resin that is virtually *unaffected* by moisture, acids and alkalis.**
2. ***Mica Flakes*—highly resistant to weather, wear and sun's rays.**
3. ***Asbestos Fibers*—used as binders to provide greater toughness and resistance to wear.**

Obviously, Insul-Mastic costs a few cents more than common asphalt coatings. But, when you measure its cost in terms of *far greater service life* (10 to 20 years is not uncommon), Insul-Mastic *always* proves to be your most economical investment!

Still another important Insul-Mastic *plus* is the technical field service which is available whenever you need application assistance. *Call your Pitt Chem Distributor for full information about Insul-Mastic coatings, today!*

Think First of the Coatings that Last!

PITT CHEM "Insul-Mastic"® Gilsonite-Asphalt Coatings

PITT CHEM "Tarmastic"® Coal Tar Coatings

PITT CHEM "Tarset"® Coal Tar-Epoxy Resin Coatings

PITT CHEM Industrial Coatings are available through leading Industrial Distributors. See the "Yellow Pages."

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what you should know about TYPE

CHARACTERISTICS OF TYPE MI

1. Just what is MI? Here's how the NEC describes MI (Article 330): "A cable in which one or more electrical conductors are insulated with a highly compressed refractory mineral insulation and enclosed in a liquid-tight and gas-tight metallic tube sheathing." The conductors and the sheath are electrolytic copper. The mineral insulation is magnesium oxide. MI IS UL APPROVED.

2. What's so unusual about it? Since it is of all-mineral construction—copper and inert magnesium oxide—it is not subject to normal destructive influences such as heat, moisture, sunlight, oils, etc.

3. Is it flame-proof? Absolutely. Magnesium oxide is non-flammable and will not support combustion.

4. What are its temperature limits? MI may be operated continuously with ceramic terminating seals at temperatures as high as 250°C (482°F). For a "one-shot" application it may be operated at temperatures as high as the melting point of copper (1083°C). Routine Code applications which use standard terminating seals should be kept at 85°C (185°F) in the termination area.

5. Is it moisture-proof? Yes. The seamless copper sheath is impermeable to moisture. Properly applied end seals completely seal against moisture.

6. Why is it electrically safer? A grounded wiring system is safer than an ungrounded one. It is *impossible* to install MI properly without effectively grounding it.

7. What is the current rating of MI? For general use, the rating is determined by the standard end seals, which are rated at 85°C (185°F).

8. What is the working voltage of the system? The maximum working voltage is 600 volts AC or DC. Factory test voltage is 2500 volts.

MI CABLE

FOR 600-VOLT APPLICATIONS

9. What's the normal life of an MI wiring installation? MI will outlast the structure in which it is installed.

WHERE MI IS USED

10. Can MI be installed in industrial plants? It is ideal for industrial installation, because it eliminates downtime and repair work due to cable failures. MI IS UL APPROVED FOR HAZARDOUS LOCATIONS.

11. Is it useful in any type of industry? It certainly is, particularly because of its resistance to heat, moisture, oils, chemicals and other harmful influences. Successful installations have been made in pulp mills, glass factories, printing plants, chemical plants, petroleum refineries, ships, coal mines, dairies, breweries, steel mills, and many others.

12. Where else is MI used? Because of its small space requirements (no conduit or duct is required), safety and neat appearance, it has been used in schools, museums, commercial buildings, hospitals, research laboratories, and in machine tool wiring.

HOW MI IS INSTALLED

13. Is it difficult to install? No, it is very easy to install. All you have to do is cut it to length, train into position and secure it by standard clamps or straps to any surface. No conduit or duct is needed. It is easy to terminate and attach to standard boxes or equipment.

14. Can it be used with other wiring systems? Yes: MI is perfectly compatible with other wiring systems.

15. Are special boxes or equipment attachments required with MI? No. You can attach it to all standard electrical boxes, enclosures and equipment. Threaded MI cable fittings in the four standard conduit group sizes and having standard conduit threads may be ordered with the cable.

16. Do you need special tools? Only two: a sheath stripper and an end seal crimping tool. Both are available from General Cable. Except for these, regular electricians' tools are all that are needed.

17. Does MI bend easily? You can bend it by hand in the smaller diameters. In larger sizes, a standard bending tool or "hickey" will do the job easily.

18. Is special training needed to install it? No. A qualified electrician can do it simply by referring to the instructions in the Instruction Manual included with each shipment.

19. Where can fittings be obtained? Fittings may be ordered with the cable in the quantity desired. They'll be delivered with the cable.

20. How about delivery? Most sizes are available from stock. The local General Cable office nearest you can give you full details.

Ask any General Cable Authorized Distributor or your General Cable Representative—at any one of the 65 General Cable offices coast-to-coast—to pinpoint actual installations of Type MI in plants comparable to your own. For a free copy of the new 12-page Type MI Catalog, just write Dept. PE-4.

GENERAL CABLE CORPORATION,
420 Lexington Avenue, New York 17, N. Y.
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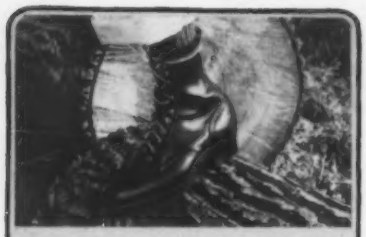

"THIS LUBRICANT SAVES 7 TIMES ITS COST IN PRODUCING SHOES"

says: WOLVERINE
Shoe and Tanning Corp.

"We use LUBRIPLATE No. 100 for lubricating the chains that drive the paddle wheels which turn hides immersed in solution. The solution is sometimes acid, sometimes caustic. Until we tried LUBRIPLATE, chain life was only about one year. After a two year test, applying LUBRIPLATE to the chains every two weeks, it appears that for every dollar we invested in LUBRIPLATE, we have saved seven dollars in chains!"

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose . . . LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK" . . . a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

For more facts circle 525 on Reply Card

BACKTALK AND FORETHOUGHTS

Edited by Marjorie E. Weissman

Liquid Sealant

PLANT ENGINEERING:

"Will you please let us know the name of the manufacturer of Loctite sealant, as described in the recent article in your magazine." *H. J. Rodgers, Purchasing, Horlicks Corp., Racine, Wis.*

PLANT ENGINEERING:

"Please furnish information on the Loctite liquid sealant described in the Janury issue of PLANT ENGINEERING." *Bill A. Leszczewicz, Master Mechanic, Gilbert & Bennett Mfg. Co., Blue Island, Ill.*

▶ Our article, which appeared in the Operation—Production section of the magazine, described the use of sealant for mounting a roller bearing in the jaw of a rock crusher. The material is manufactured by American Sealants Co., 241 Woodbine St., Hartford 6, Conn.—*Editors.*

Asks for More About "Moly"

PLANT ENGINEERING:

"I have frequently heard of outstanding claims and high savings in lubrication by converting to a molybdenum disulfide application. I am interested in learning more about this subject and would welcome any literature or practical reports on this matter." *Paul J. Tanasi, Chief Plant Engineer, Royal McBee Corp., Hartford, Conn.*

▶ Tear sheets of "Is It True What They Say About Moly?", published in our May 1954 issue at the time when molybdenum disulfide was first gaining recognition as a lubricant additive, have been forwarded to this reader. With these, we have sent the names and addresses of several manufacturers of lubricants containing "moly."—*Editors.*

Plant Safety Program

PLANT ENGINEERING:

"We will indeed appreciate any reprints of articles or bulletins you may have in your files relative to product inspection and quality control, and to plant safety programs.

"We manufacture steel closures for drums with presses ranging from 20- to 1000-ton capacity. We also have a Plastics Division which makes injection mold plastic closures for the small container industry. Any information you have will indeed be appreciated." *Mahlon E. Rieke, Exec. Vice President, Rieke Metal Products Corp., Auburn, Ind.*

▶ Several articles have appeared in PLANT ENGINEERING dealing with plant safety programs and copies of these have been sent to Mr. Rieke. We do not publish material on product inspection and quality control and therefore, are unable to answer this part of his request.—*Editors.*

Urethane Coatings

PLANT ENGINEERING:

"We have read with interest the article 'Urethane Paint Protects' on page 87 of PLANT ENGINEERING magazine, December, 1958.

"We are interested in making a trial application of the coating, but we would like additional information, if available, such as concerning possible necessary safety precautions, methods of mixing, and suppliers. We will appreciate this information and hope it will not inconvenience you too much." *G. H. Clem, Staff Engineer, American Viscose Corp., Parkersburg, W. Va.*

PLANT ENGINEERING:

"We have been informed that your recent publication has had information on Nacconate material made by National Analine Corporation, that is applied to wooden plates and frames used in filter presses. Will you please send us a copy of this article?" *C. H. Mohr, Filter Press Department, D. R. Sperry & Co., Batavia, Ill.*

PLANT ENGINEERING:

"An article appearing in the December, 1958 issue of PLANT ENGINEERING described the use of urethane paint for protecting wooden press frames. This article was written by E. J. Aquardo of the Interchemical Corporation.

"We have a problem in a similar vein and would appreciate learning the address of Mr. Aquardo, as well as the supplier of wooden press frames used in their operation." *Marion B. Foley, General Foreman, Glutamate Section, A. E. Staley Mfg. Co., Decatur, Ill.*

▶ For data on urethane coatings in general, their formulation, properties, the raw materials to use and so on,

whenever
water
enters
the picture . . .

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...the type with which you are thoroughly familiar.

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In Canada: McKinnon Columbus Chain Limited, St. Catharines, Ontario

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BACKTALK— FORETHOUGHTS

readers should write to James P. Foley, Allied Chemical Corp., 40 Rector St., New York 6, N. Y. Those readers who wish to get in touch with the author should write to Edward J. Aquardo, Plant Manager, Interchemical Corp., Hawthorne, N. J.—*Editors.*

Construction Briefs Reprinted

PLANT ENGINEERING:

"Please advise if reprints of the series of articles 'Designing in Reinforced Concrete,' by B. A. Wasil, are available. If so, I would like to obtain a set. Please advise as to the availability and cost." *W. J. Jensen, Manager, Building Utilities Div., Deere & Co., Moline, Ill.*

▶ The series of Construction Briefs on designing in reinforced concrete has been reprinted in a seven-part booklet. It is available at a cost of 75 cents a copy.—*Editors.*

Storage Conveyor

PLANT ENGINEERING:

"We would like to know who designed the storage conveyor system mentioned in the article 'Planned-In Materials Handling' which appeared in PLANT ENGINEERING, November, 1958." *L. L. Smart, Methods Engineer, Pressed Steel Tank Company, Milwaukee, Wis.*

▶ The conveyor used by the Day and Night Co. and The Payne Co., for overhead storage at their La Puente, Calif. plant, is a product of Mechanical Handling Systems Inc., 4601 Nancy Ave., Detroit 12, Mich. The system was engineered by Ted Bottiggi of The Payne Co., and modified by company engineers.—*Editors.*

Motor Foundation

PLANT ENGINEERING:

"Would you please send me a list on Construction Briefs on foundation anchor bolts and what each Brief contains. Would appreciate this very much as I have a 100-hp motor and would like to know how to secure this motor fast to the foundation." *W. J. Rendleman, Pittsburgh, Pa.*

▶ The series on reinforced concrete, currently appearing in the Construction Briefs department of PLANT ENGINEERING, has been concerned primarily with theories and design criteria for reinforced concrete slabs and columns. Applications concerned with foundations have not yet been discussed. However, we have published material on groutings and foundations which we hope will assist this reader. Tear sheets of appropriate articles have been mailed to him.—*Editors.*

Rubbish Handling Equipment

PLANT ENGINEERING:

"In the December, 1958 issue of your magazine, PLANT ENGINEERING, we saw a very interesting article on rubbish removal. This article was written by Lawrence A. Squitieri, Engineer, Distribution Planning Organization, Western Electric Co. He mentioned the use of a compacting truck body.

"From what source could we obtain information on this type of equipment to fit a 1956, 1½-ton Dodge truck?" *W. J. Lawrence, Works Engineer, Westinghouse Electric Corp., Air Conditioning Div., Staunton, Va.*

PLANT ENGINEERING:

"Would you please send me more information about the equipment described in the article 'Rubbish Removal Study' which appeared in your December, 1958 issue." *P. F. Goldfine, President, Cleveland Ceramic Corp., Euclid, Ohio.*

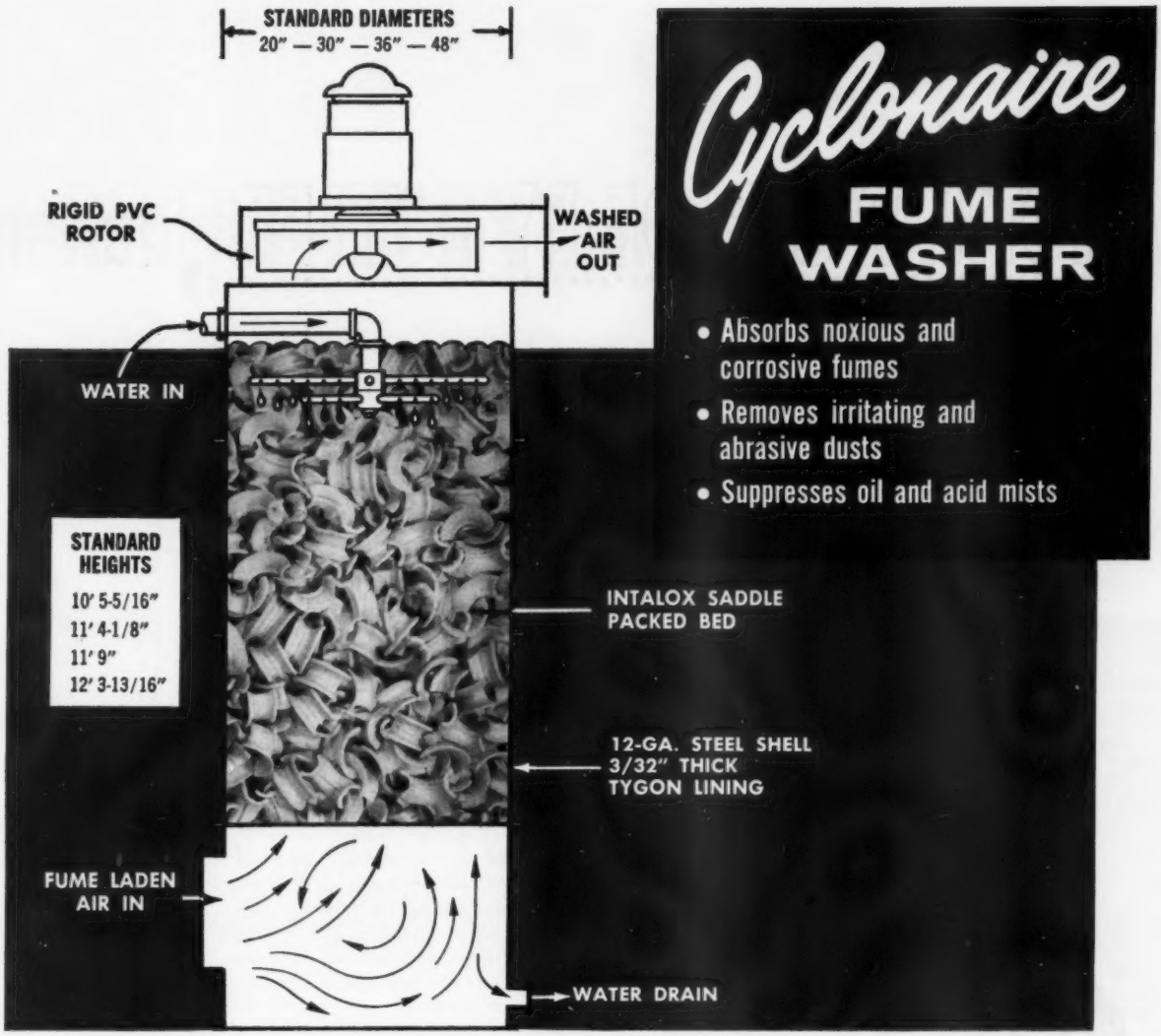
▶ We asked Western Electric if they could provide the information sought by these readers. E. J. Hardy, Assistant Superintendent, Engineering Equipment Development sends us the following reply:

"The compacting truck we utilize is manufactured by the Hydro E-Z Pack Division of Hercules Galion Products, Inc., Galion, Ohio. We require a number of special features on these trucks and the supplier provides them in accordance with our specifications. The supplier is therefore able to provide you with the details of these changes and we feel sure, will also supply whatever literature is available.

"The collection bins used throughout our houses are rectangular bins mounted on casters and hooked together with cross bar hitches to provide a means of towing up to five bins in tandem.

"Our unloading mechanism is a specially designed, electrically operated unit which accommodates our tow bins and unloads them directly into the compacting truck. Similar equipment is available commercially from several suppliers."

We are glad to be able to pass along the above information, which should be very helpful to readers contemplating the purchase of this type of equipment.—*Editors.*



Cyclonaire FUME WASHER

- Absorbs noxious and corrosive fumes
- Removes irritating and abrasive dusts
- Suppresses oil and acid mists

The "Cyclonaire" is a surprisingly compact wet bed scrubber. It will fit almost anywhere, but it does a fume removal job formerly possible only with expensive custom-designed units. Removal of many gases (of 1% concentration or less) is up to 99% effective. Low power requirements make it very economical to operate.

The standard "Cyclonaire" consists of a bottom section containing a packing support plate, fume intake duct, and liquid drain; two intermediate sections packed with Intalox Saddle Packing; a distributor section containing a water or liquid inlet and liquid distributor; and a top section containing the blower, drive motor and washed air outlet.

The unit is made of 12 gauge steel, lined with 3/32" thick Tygon sheet plastic. The rotor is made of rigid PVC plastic. All exterior surfaces are protected with Tygon "ATD" Hot Spray Paint.

The "Cyclonaire" is available in four sizes with rated capacities of 750, 1650, 3500 and 6000 cfm.

Its low initial cost, its low operating cost, its high efficiency make the "Cyclonaire" a logical choice for a wide range of fume scrubbing operations. Full technical data in Bulletin FW-10. Write for it today.

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PROCESS EQUIPMENT DIVISION

U. S. STONEWARE

AKRON 9, OHIO

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For more facts circle 528 on Reply Card

ANOTHER STRIDE BY BUTLER toward

Revolutionary new insulated curtain wall factory cut to fit Butler structurals

Someday soon, complete industrial and commercial buildings will be factory-fabricated, and assembled from standard parts on the site. The Butler system of pre-engineered buildings has already made rapid strides towards this goal.

Now Butler announces Monopanl®. . . a new factory-fabricated, factory-insulated wall panel. Monopanl creates the entire exterior wall, complete with decorative outer face, insulation and finished interior face. Each panel is factory-sized for precision fit on Butler structural systems. Monopanls are merely bolted in place. Your building is completed with incredible speed. The result – an attractive building that will compare in quality to the best traditional construction, yet will conserve your capital.

With new Monopanl, Butler now offers the most advanced pre-engineered . . . factory-fabricated system of building for commerce and industry. Get all the facts and learn about Butler financing from your nearest Butler Builder. He's listed in the Yellow Pages under "Buildings" or "Steel Buildings." Or write directly to us.

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A. Francik and
Associates, Architects

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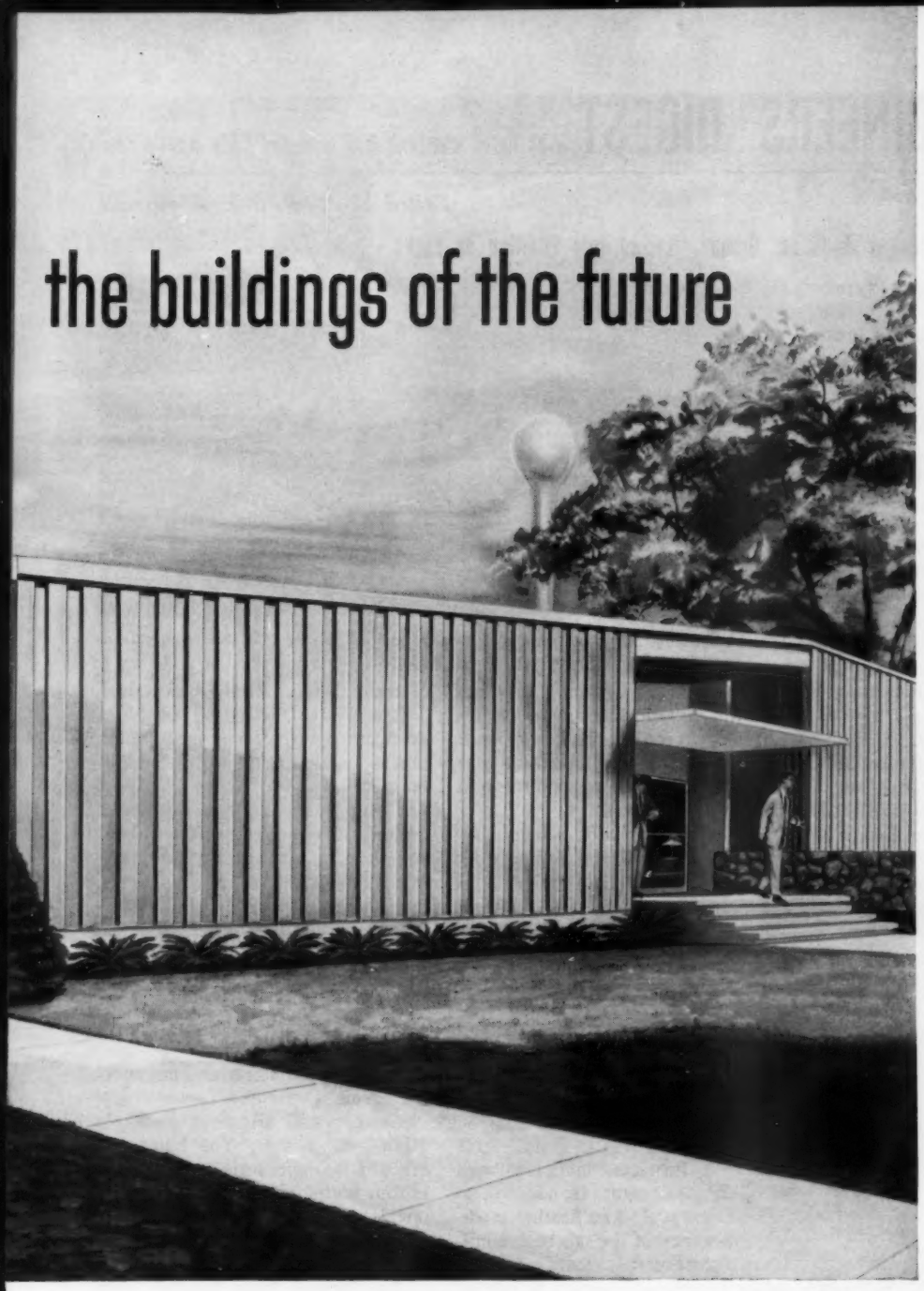
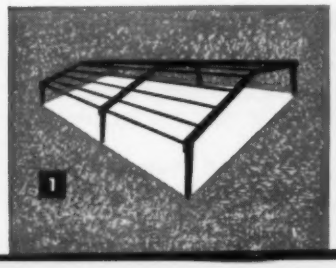
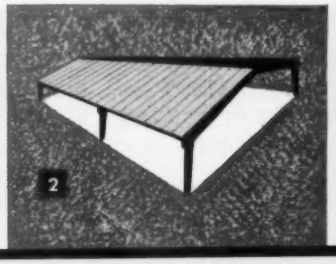
the buildings of the future

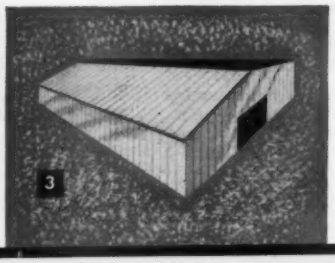


Now, more than ever, the fastest, lowest-cost way to build well

Butler pre-engineered components fit together so perfectly that construction is little more than an assembly job. 1. Butler structurals are bolted together and erected. 2. The Butlerib roof is attached. 3. Monopanl walls are installed by simply pushing together and fastening to the structurals top and bottom. Your building is completed and you're in business, earning profits weeks, even months sooner, than ordinary construction methods would have permitted.



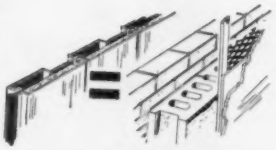




How Monopanl creates a superior wall

Each Monopanl is literally a metal plank with insulation between metal inner and outer faces. The complex configuration makes Monopanl the longest spanning . . . most rigid panel of its type.

The unique double tongue and groove design creates a strong panel-to-panel joint. And double vinyl gaskets permanently seal out moisture, last the life of the building.



Monopanl is only 3 inches thick, yet is equal in insulating ability to a masonry wall of 4 inches of brick, 8 inches of concrete block, 1 inch of rigid insulation with air space and ½ inch of plaster.

PLANT ENGINEERS' DIGEST —so those who rush may read and know what's new

Edited by Marjorie E. Weissman

Barrel-Vault Roof for Hangar Built on Ground, Raised into Position by Jacks

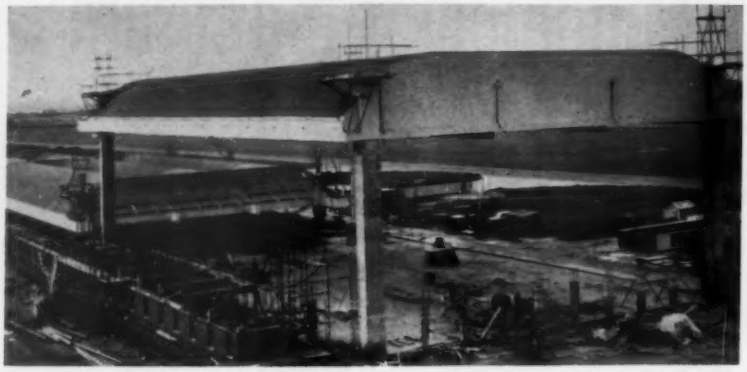
THREE 1400-TON, barrel-vault, prestressed concrete roofs for a new hangar at a British airfield were fabricated at ground level on the site and raised into position with the use of sixteen, 200-ton hydraulic jacks. This method of construction was developed by John Laing and Son Ltd. and consultant engineers.

Construction cost represented a considerable saving over conventional methods in terms of labor, scaffolding and equipment.

The hangar consists of three similar bays, each 180 ft long by 120 ft wide, linked by two bays 36 ft wide. The barrel-vault roofs are supported only by a column in each corner, giving a clear floor area of 613 ft by 103 ft.

Construction of the roofs began after laying the foundations, hangar floor, entrances and aprons. Building paper laid on the floor prevented adhesion of roof beams, which were concreted direct on the floor.

Fabrication in this manner made the job of pre-stressing simple. The 39 miles of wire required for each roof was laid out full length, sheathed and built into the beams as work proceeded. Walkie-talkie radio was used by engineers to control tensioning of the wires.

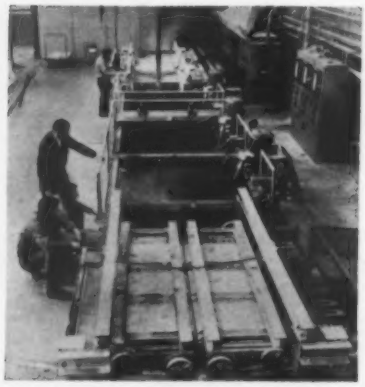


One of three barrel vault roofs is shown in position; other two are being raised.

Traveling formwork built on bogies was used to concrete each vault in four sections. The use of a 5-ton derrick crane and side discharge buckets were used to place much of the concrete. Roofs were raised 7 ft a day to their total height of 46 ft, by four hydraulic jacks. Each precast section took up to one half hour to position. When the roof had been raised 2 ft 8 in. above the ground, subcontractors were able to complete the work of installing heating panels, steel etc. *From Target, published by Central Office of Information, London, England.*

Salt Bath Furnaces Help to Heat Treat Variety of Parts in Large or Small Batches

PROVIDING EQUIPMENT for heat treating a large variety of airplane parts in limited experimental quantities and for processing other components on a production line basis, was the problem that faced engineers at the Columbus, Ohio plant of North American Aviation, Inc.



Salt bath line is used for heat treating varying quantities of airplane parts.

The solution was to install three salt bath furnaces, complete with auxiliary equipment. In addition to providing a scale-free heating medium, buoyancy of the salt bath eliminates distortion that would otherwise occur because of uneven weight of the parts.

One high-temperature, eight-electrode bath is used to treat air hardening and high density alloys at temperatures from 1800F to 1875F. If necessary, the temperature level can be raised to 2400 F.

A second furnace, operating from 1500 F to 1650 F, processes aircraft steels and preheats work that is subsequently treated in the high temperature bath. The third bath operates from 1000 F to 1200 F and is used for tempering air hardening and high speed steels and commercial steels.

Capacity of all three baths is 30,000 lb of salt. The baths are brought to operating temperature in four hours from a cold start. Air-operated rolling covers prevent loss of heat through radiation or convection by drafts.

The furnace units, together with oil quench, caustic soak and hot water rinse, are positioned in a straight line. Work is handled in and out of the baths by an overhead crane and the entire line is operated by two men. *From a release of the A. F. Holden Company, Detroit, Mich.*

Radiant Heat for Hangar

RADIANT HEAT from an embedded coil system was the method chosen to heat a hangar designed for use

NOW a single Condulet® for any make motor starter and circuit breaker!

*TYPE DMC: Dust-Ignition-Proof (Dust-Tight) — National Electrical Code Class II, Groups E, F and G; NEMA Type 9EFG.

**TYPE WMC: Watertight — NEMA Types 3, 3R, 4 and 5.

UNIQUE COVER HINGING ARRANGEMENT allows DMC-WMC Condulets to be mounted directly adjacent to other Condulets without providing extra space between for cover to hinge open. Cover pulls out, then to *either* side to clear adjacently-mounted Condulets or other equipment.

CROUSE-HINDS TYPES DMC* AND WMC** Combination Line Starter CONDULETS

DMC-WMC Condulets are designed to accept and operate any of the various makes of motor starters and circuit breakers. Single speed non-reversing combinations are equipped with a universal mounting plate, motor starter reset assembly and circuit breaker operating assembly. No substitutions of any parts on the Condulets are required.

Built-in push-button stations and selector switches with various contact arrangements, pilot lights and control transformers can be supplied. Push-button and selector-switch operating shaft holes and pilot-light holes may be drilled, tapped and plugged for future use.

Separate mounting lugs are bolted on body. A center position is provided on back of body so that lugs can be attached for 3 point suspension or center pole (2 point) mounting. Circuit breaker handle has provision for padlocking in "On" or "Off" position.

WRITE for descriptive literature and specifications . . .
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● CONDULET® ELECTRICAL EQUIPMENT (Explosion-Proof and Conventional) ● FLOODLIGHTING
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For more facts circle 530 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 42)

as an aircraft maintenance building at Burnham Aircraft Inc., Colorado Springs, Colo.

One side of the 13,000 sq-ft hangar consists of doors that permit the entry of aircraft. During cold weather this meant that a flood of cold air would enter the building whenever the doors were opened, a condition to be avoided. Also, adequate heat was needed not only for the hangar, but to clear ice and snow from an outside ramp without danger of frozen pipes. Doors also had to be prevented from freezing closed in severe weather.

To answer these problems, a circulating hot oil heater was installed. Hot oil is circulated through four separate piping circuits installed in the floor and outside ramp. These are independently and automatically controlled by their own thermostats. *From a release of Childers Manufacturing Co., Inc., Albuquerque, N. M.*

Loading Light Speeds Work

A SPRING-ACTION overhead loading light has helped to speed freight transfer operations at the Wabash Railroad Freight Terminal, Chicago, Ill. Fifteen hundred tons of freight are handled daily at the terminal.

Loading light is pulled in place by hook.

The fixture is designed to meet the needs of truck or boxcar loading. It consists of a telescopic device with gooseneck extension arm which suspends a wire-guarded light.

In use, the gooseneck extension arm is pulled down and hooked under the car roof. It remains in place by spring tension but releases itself if the car or truck is moved. The main arm has a swivel snap at the top for attachment to a support bracket or messenger wire along the loading dock.

More than 200 of these lights are used at the terminal. One advantage of their use is that cords and cables are out of the way of the work area which eliminates possible accidents. *From a release of The Pyle-National Co., Chicago, Ill.*

Fixture for Extended Testing of Fire Hoses

Fixture for tying down hose during extended test is shown above. Heavy timber can be substituted for steel. Rig, hose and nozzle must be anchored securely. (From Sentinel, published by Factory Insurance Association, Hartford, Conn.)

Air Conditioning Registers Get Epoxy Resin Finish

NEARLY TWO YEARS' experience in the use of an epoxy resin type finish, electrostatically applied to air conditioning registers and grilles, has led our company to believe that it is about twice as effective, under similar conditions of wear and corrosion, as standard type sprayed-on enamel.

Registers finished with epoxy resin base have shown exceptionally greater wear resistance, over the same period, than another type of finish we previously used. In bending and flexing tests, the resin type finish withstood the treatment long after the other finish had broken down.

In tests made under adverse conditions where excessive moisture, salt atmospheres and even complete immersion over long periods were encountered, registers with the epoxy resin finish showed no sign of rusting.

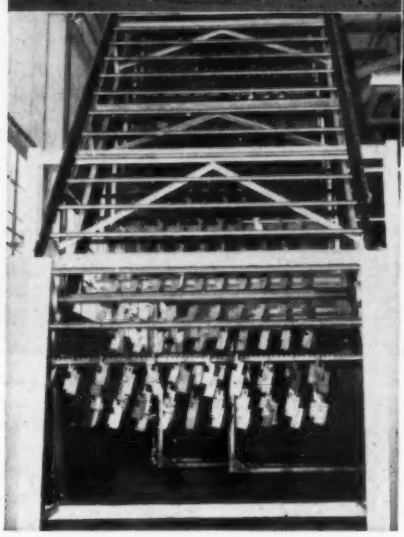
Applying the finish by an electrostatic process has provided a production advantage as well, as the method pulls the paint into all crevices and corners. The finish is then cured by baking the product for 12 min at 400 F. The final result is a tough, uniformly smooth finish. *From a release of Lima Register Co., Lima, Ohio.*

UPVC Piping In Plating Room

ON THE BASIS of field and laboratory tests, normal-impact unplasticized polyvinyl chloride was selected for the 1-in. to 4-in. piping to handle acid solutions and deionized water at the National Lock Company's Fastener Division plant at Rockford, Ill.

The 1-in. and 2-in. lines carry 37 per cent muriatic acid to acid dip tanks while the 3-in. and 4-in. lines used throughout the plating department, carry spent acid solutions to treatment tanks. These solutions include hydrochloric, nitric, acetic, phosphoric and other

FINISHING SYSTEMS...



The 8 Ft. wide Crossbar Conveyor carries a variety of products and a great mass of small parts through all processing units of the Dip Coating System. The Crossbars in the Conveyor are designed for a work load of 250 lbs.

Complete Mahon Installation Provides Compact Facilities for DIP COATING and SPRAY PAINTING in CUTLER-HAMMER'S Lincoln, Illinois Plant!

In this unique finishing system, the greater part of which is located on the roof, Mahon engineers have employed what is probably the longest continuous crossbar conveyor ever designed into equipment of this type.

The painting enclosure shown above is inside the large electrical plant. This enclosure is divided into two sections, one of which has a paint mixing room on the ground floor and paint Dip Tanks on a mezzanine floor above. The other section houses two Spray Booths and a Batch-Type Finish Baking Oven. The conveyorized, Five-Stage Metal Cleaning and Rust Proofing Machine, Dry-Off Oven, Finish Baking Oven and the Filtered Air Supply Equipment are housed in one enclosure on the roof.

This is the third complete finishing system installed by Mahon in Cutler-Hammer Plants across the country.

If you have a finishing problem, or are contemplating new finishing equipment, you, too, will want to discuss methods, equipment requirements and possible production layouts with Mahon engineers . . . you'll find them better qualified to advise you, and better qualified to do the initial planning and engineering which is so important in specially designed equipment of this type.

See Sweet's Plant Engineering File for Information, or Write for Catalogue A-659

THE R. C. MAHON COMPANY • Detroit 34, Michigan

SALES-ENGINEERING OFFICES in DETROIT, NEW YORK and CHICAGO

. . . the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the item of GREATEST VALUE to YOU!

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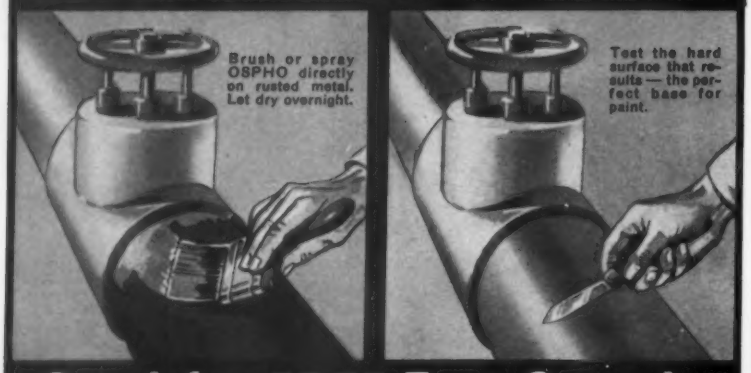
SEE FOR YOURSELF HOW

OSPHO®

PREPARES RUSTED METAL FOR PAINTING...


Brush or spray OSPHO directly on rusted metal. Let dry overnight.
Test the hard surface that results — the perfect base for paint.

Send for FREE Test Sample

Eliminate sand-blasting or flame-cleaning. Simply brush off loose rust and apply OSPHO on the rusted metal surface. One application *kills* the rust and provides a *sound* base for your regular maintenance paint. Rust action is stopped — paint jobs last much longer.

OSPHO is *not* a primer — *not* a paint. It is a carefully balanced phosphate chromate metal treatment which chemically changes rust (iron oxide) into iron phosphate — an inert, hard, gray surface ideal for painting.

OSPHO provides excellent coverage . . . a gallon treats up to 600 square feet. And cost is low. Available in 1-gallon containers (in cases of 4), 5-gallon pails, 50-gallon barrels. Colorless, non-toxic, non-flammable. Available through distributors.

Repeat orders over the past 16 years are proof of OSPHO's effectiveness. *See for yourself . . .*

Write Now For FREE Test Sample
(on company letterhead)
and descriptive literature

TREATS NEW METAL TOO!
When applied on new ferrous metal, galvanized iron and aluminum, OSPHO imparts a slight etch to the metal, insuring tight bond of the paint coat that follows.

ONLY OSPHO KILLS THE RUST

RUSTICIDE PRODUCTS COMPANY
3125 Perkins Avenue • Cleveland 14, Ohio

QUALITY MAINTENANCE PRODUCTS SINCE 1917

For more facts circle 532 on Reply Card

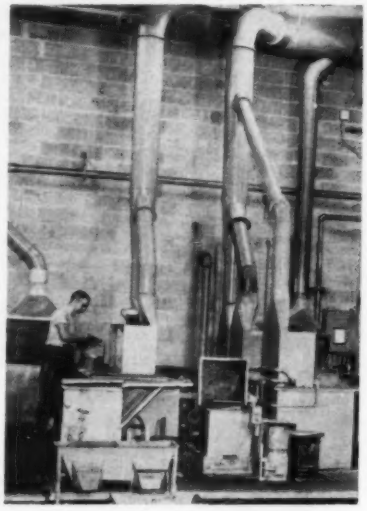
PLANT ENGINEERS' DIGEST

(Digest begins on page 42)

acids of varying concentrations. Operating pressures are 40 psi at temperatures ranging from 60 F to 90 F.

Directional changes in these piping systems are made with injection molded UPVC fittings. All connections were made with solvent cement brushed on to the joints. Where UPVC pipe is flanged to metallic equipment such as pumps and valves, neoprene gaskets are used. Horizontal UPVC piping is supported by metal swing hangars spaced 3 ft on center.

UPVC piping was used for this



Unplasticized polyvinyl chloride is used in plating department for piping and exhaust ducts on the various tanks.

installation because of its resistance to corrosion, both internal and external; absence of galvanic or electrolytic action; protection of acid and make-up water from discoloration and contamination; and reduced maintenance costs. *From a release of Tube Turns Plastics, Inc., Louisville, Ky.*

Precision Cutting With Masonry Saw

THE CERAMIC DIVISION of Selas Corp. of America manufactures, among other items, microporous porcelain products for the filtering of industrial, biological and phar-

Change hats
with your maintenance man . . .

You'll find out . . .

Vertical Lift Metal-clad is safer; you can see when it's disconnected

Peace of mind means a lot when your work involves contact with thousands of volts of electricity. Ask your maintenance man which make of metal-clad gives him peace of mind, and he'll tell you G-E Vertical Lift. He can see when the primary disconnects are parted—no need to guess whether or not the breaker is safely open. And, all live parts are automatically shielded as the breaker disconnects.

Before you buy your next switchgear line-up, consider your maintenance man and the see-able peace of mind only Vertical Lift Metal-clad can give him. General Electric Company, Schenectady 5, New York. 511-32

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GENERAL ELECTRIC

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DAY

Pneumatic Conveying & Bulk Storage News

FREE! 2 valuable guides for selecting PNEUMATIC CONVEYING and BULK STORAGE TANKS

BULLETIN M-588—12 page DAY pneumatic conveying guide just off the press. Discusses types of systems, illustrates and diagrams high and low density arrangements, shows equipment and tells "why" and "wherefore" of all types of pneumatic conveying including so-called fluidizing systems.

BULLETIN 574—12 pages, describes horizontal and vertical storage tanks. Points out savings and is filled with photos of various installations plus description of auxiliary equipment.

Whatever your pneumatic conveying or bulk storage problem, look first in these DAY bulletins. They are valuable aids in selecting and ordering the right equipment for your plant. For your free copies use reader service card of this magazine or write direct toDAY.

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PLANT ENGINEERS' DIGEST

(Digest begins on page 42)

Masonry saw cuts microporous porcelain filters quickly and accurately.

maceutical liquids and gases. A high degree of precision is required in their production.

After being molded, all refractories shrink during the drying operation and it is necessary to allow for shrinkage in the initial moldings. Therefore, pieces are made slightly oversize, then trimmed down on a masonry saw with break-resistant abrasive blades. This demands a high degree of accuracy for special shapes and is difficult to obtain on hard surfaces. However, satisfactory results are obtained with the masonry saw.

The saws remove material at a reasonable rate with closely controlled accuracy. In 10 years of service, maintenance requirements have been negligible.

In addition to regular daily production uses in the ceramic division, the saw is utilized to alter more usual mold shapes to suit other specialized applications, while two other saws are maintained in the furnace department to ease the task of cutting and shaping refractory bricks to line furnaces. *From a release of Clipper Manufacturing Co., Kansas City, Mo.*

Servicing Gas Meters

SEVERAL tips on repair and reconditioning of industrial gas meters are offered by our engineers. To restore old meters they recommend:

1. Valve grinding: Emery or car-

borundum paper carefully mounted on heavy plate glass blocks provides as true a surface as is possible to obtain commercially. Either wet or dry paper may be used. The emery paper is attached to the block by use of shellac or sealing wax; it is important to get a thin, even coating in order to maintain flatness. It should be brushed often.

2. Grinding thickness: The size of the block should be larger in area than the valve or seat being ground. For domestic cast meters, a block large enough to grind both valve seats simultaneously is recommended.

Keep the block flat while grinding. A minimum of material should be removed and a "Figure 8" grinding motion will produce a very good finish. No. 80 grit paper is satisfactory for a rough grind and finishing should be done with a No. 150 grit paper.

3. Cleaning valves and valve seats: Usually, a thorough cleansing of valves and valve seats is sufficient to put meter in good working order. Clean with benzene, alcohol or naphtha.

4. Checking valves for flatness: If opposite corners of the block are tapped with finger tips when the block is placed on the valve, rockiness or uneven grinding can very easily be detected.

5. Cements for valve seat to valve plate sealing: Shellac or a glyptol type of cement are both satisfactory. Glyptol is somewhat easier to work with and gives slightly better results.

6. Reoiling diaphragms: A mix which is acceptable for reoiling diaphragms would be a 4:1 ratio of Acme D oil to petrolatum. It should be heated to approximately 140 F before applying to the diaphragm leather with swab or spray.

7. Grease for packing boxes: A non-fluid type oil having a consistency of cup grease can be used very satisfactorily in packing boxes to aid in lubricating felts and preventing leakage at these points.

8. External cleaning of meters: A caustic base stripper gives good results. Sand blasting is also used.

9. The meter paint: A satisfactory meter paint is a quick drying enamel with an epoxy resin base. This gives a good protective coating and, due to its quick drying properties, facilitates meter repair.

10. Proving techniques: Within

DAY

DUST CONTROL NEWS

Free! 9 informative

dust control equipment bulletins

You can save time when planning and save money when buying if you'll send for these DAY dust control bulletins. Each contains valuable information about dust control equipment and systems. Here's general information plus useful technical data and specifications. Ask for any bulletin which interests you or write for them all – they're free. Use this magazine's reader service card or write direct toDAY.

BULLETIN G-579 — Describes the DAY Type "RJ" filter. An all purpose, versatile unit. Bulletin gives operating features, dimensions and specifications.

BULLETIN 573 — Dual-Clone dust separators — noted for their low resistance and high cleaning efficiency. Easy to install, no maintenance, no moving parts.

BULLETIN 576 — "HV" heavy duty dust separator. Rugged construction and lower initial cost than many light gauge galvanized type cyclones.

BULLETIN F-75 — Reverse Jet Dust Filter Facts. Complete with specifications, typical equipment layouts, capacity and performance tables for DAY type "AC" filter.

BULLETIN N-578 — Gives complete information about Style "A" rotary valves. Construction features, specifications, dimensions and applications.

"SCHLITZ DEFEATS DUST" — FOOD ENGINEERING magazine reprint describes all out dust control for 3½ million bushel Schlitz grain elevator. Request Bulletin "Schlitz Defeats Dust."

"EFFICIENT DUST SNATCHERS" — Bulletin describes DAY's part in providing maximum safety and good housekeeping for starch packing building of large food processor.

BULLETIN 510 — DAY Unit Dust Collectors. Complete, low cost unit designed for plants or applications where central dust control systems are not practical.

BULLETIN I-585 — Industrial Fans. Complete with helpful selection charts, capacity tables, dimensions and specifications. Information on special types and arrangements included.

The DAY Company

SOLD in UNITED STATES by
The DAY SALES Company
807 Third Avenue N.E.
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DAY SINCE 1881

MADE and SOLD in CANADA by
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Representatives in Principal Cities

EQUIPMENT ONLY OR A COMPLETE SYSTEM

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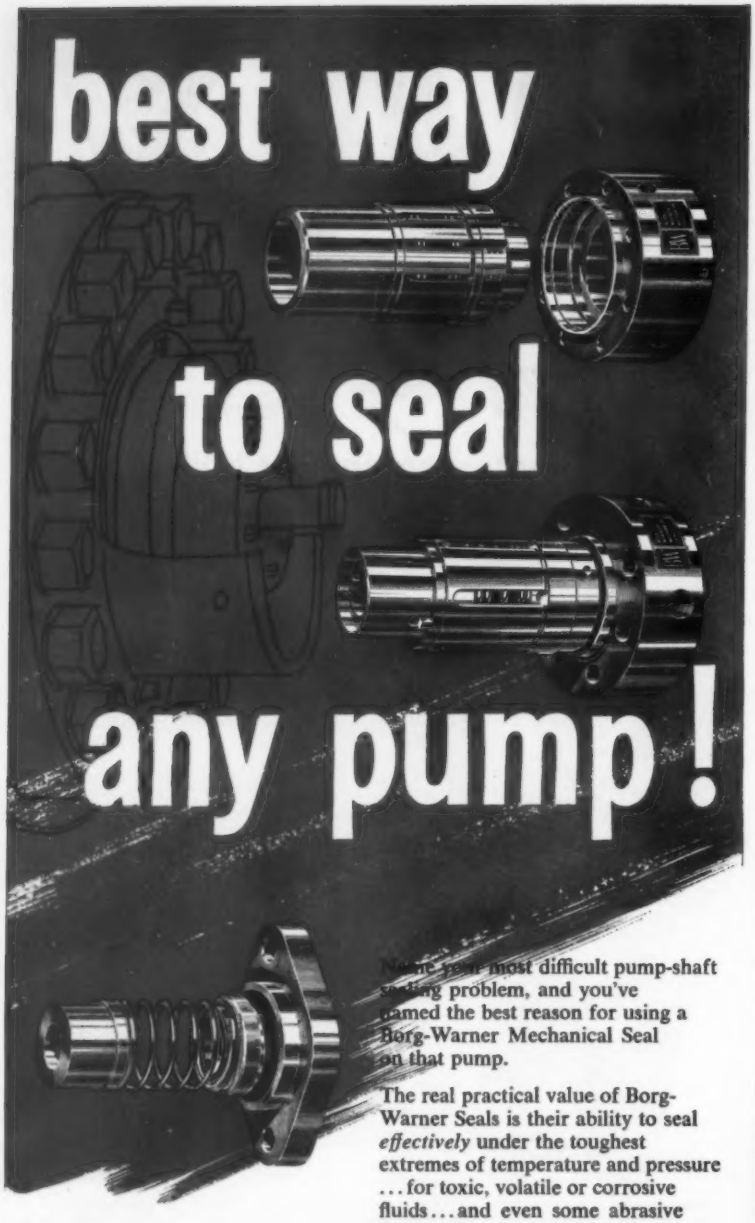

Name your most difficult pump-shaft sealing problem, and you've named the best reason for using a Borg-Warner Mechanical Seal on that pump.

The real practical value of Borg-Warner Seals is their ability to seal *effectively* under the toughest extremes of temperature and pressure ... for toxic, volatile or corrosive fluids ... and even some abrasive liquids. *Result*—less down time, elimination of expensive stuffingbox maintenance, and savings of the pumped fluid.

Borg-Warner Mechanical Seals

NOW AVAILABLE—a new file folder of Borg-Warner Mechanical Seal designs shows some of the many types and applications possible for pumps, mixers, autoclaves and for special rotating shaft problems. Send for your copy today—there's no obligation!

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PLANT ENGINEERS' DIGEST

(Digest begins on page 42)

the proving room itself the temperature should be constant—temperature of the air, the oil in the bell, and the meters themselves should be within plus or minus 1 F. Drafts and sources of heat supply should be kept away from the testing equipment.

The bell prover should be clean, level, and free of binds. The air passed through the bell should be taken from the proving room in order to maintain temperature balance. The prover should be regularly bottled in order to check and maintain its degree of accuracy.

11. Meter balance: Primary sources of unbalance are in the positioning of valves, positioning of the diaphragms, and the coordination between the two. Any one of these three can disrupt meter operation.

12. Testing meter performance: A slope or draft mounted in conjunction with the proving equipment to measure the difference in pressure between the inlet and the outlet of the meter, is useful.

Fluctuation of this differential pressure reflects degree of gage unbalance, binds, or poor timing. *From a release of Rockwell Manufacturing Co., Pittsburgh, Pa.*

Floor Grating

Open flooring is standard practice at Commonwealth Edison Co. power stations. Roughened, twisted bar grating was used for floors and stairways at Waukegan, Illinois plant. (From a release of Blaw-Knox Co., Pittsburgh, Pa.)

A Y Globe that challenges comparison shows it pays to

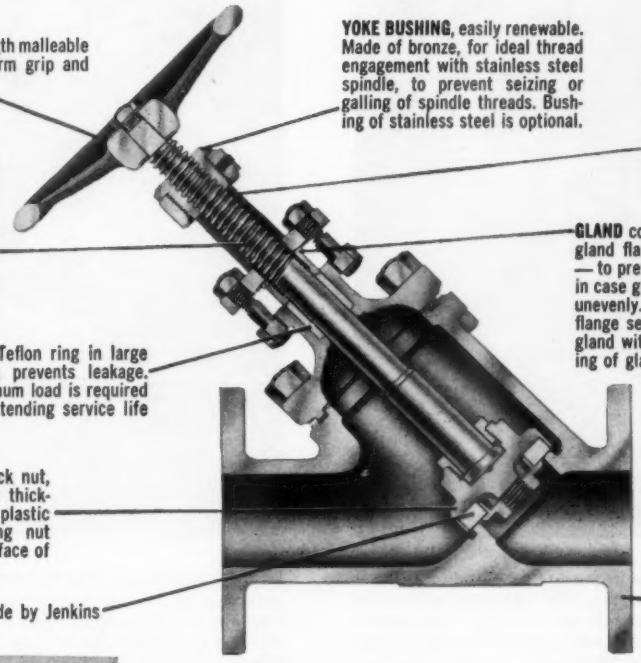
Specify JENKINS for STAINLESS STEEL Valves, too

Want the "best buy" in Stainless Steel Y Globe Valves? Compare this Jenkins Fig. 1335 with any on the market. You'll conclude that it's hard to beat Jenkins at making valves, no matter what the material.

You'll find genuine superiority of design and construction in the features shown here. But no picture can show the quality of the castings . . . the precision machining . . . the rigid inspection and testing that have gone into this valve. All of these are as important as design and metal alloys in assuring long, dependable, economical valve service. And, all of them are up to the peak standards for which Jenkins has been known for almost a century.

SEND FOR NEW CATALOG of Jenkins Stainless Steel Valves, in patterns and alloys that satisfy the requirements of practically all corrosive services.

These Jenkins Valves meet valve industry specifications and the high standards established by leading users of stainless steel valves.



WHEEL of high strength malleable iron designed for firm grip and easy operation.

SPINDLE of large diameter and dense structure has high resistance to wear and torsion strains. Easy, tight closing is assured by long, precision machined thread bearing surfaces. A beveled shoulder provides backseating against inside of bonnet, permitting repacking under pressure.

PACKING A Teflon ring in large packing box prevents leakage. Only a minimum load is required on gland, extending service life of packing.

DISC HOLDER, held by lock nut, has depth equal to disc thickness, preventing flow of plastic disc. Wide disc retaining nut covers all but seating surface of Teflon disc.

DISC is Teflon made by Jenkins

YOKE BUSHING, easily renewable. Made of bronze, for ideal thread engagement with stainless steel spindle, to prevent seizing or galling of spindle threads. Bushing of stainless steel is optional.

YOKE BONNET, a single unit, has liberal space between yoke arms for easy access to packing box. Tongue and groove joint with body makes a pressure-tight seal with less tightening on the bolts, and eliminates possibility of blowing out the Teflon gasket.

GLAND consists of two pieces — gland flange and gland follower — to prevent binding of follower in case gland bolts are tightened unevenly. Crowned surface of flange secures tightness against gland without excessive tightening of gland nuts.

BODY Through-port design for full, free flow. Liberal seat height permits repeated refacing. Cast on body are directional arrow and bosses for drain connections. End flanges conform to M.S.S. specifications.

JENKINS VALVES

LOOK FOR THE JENKINS DIAMOND

Sold Through Leading Distributors Everywhere

JENKINS BROS., 100 Park Avenue, New York 17, N. Y.

☐ Send the new stainless steel valve catalog

☐ Have a representative call on me

NAME & TITLE.....

COMPANY.....

ADDRESS.....

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When it's Ilg ventilating equipment...

Noisy ventilating equipment in your plant is not only annoying—it becomes expensive. For, in addition to cutting down efficiency among employees, noise often points up the lack of dynamic balance in ventilating equipment . . . is the sign of accelerated wear.

With Ilg fans and ventilators you don't have to worry

Here's why ILG *fans and assure silent service,*

Not a Bubble in the Burgundy—due to vibration, that is. This 42" direct-connected, dynamically balanced, self-cooled Ilg propeller fan—turning at full speed—is so vibration-free that you have to look *below* the surface of the sparkling burgundy to spot any motion whatsoever.

Silent Centrifugal Performance starts with these backward curved (BC) blades and *airfoil* design that eliminate eddy currents and turbulence. Other "silencers" are: Ilg's smooth contour air intake; Ilg-built motors and direct-connected fan wheels. No belts or pulleys to slip and slap. Sized for operations to 9" static pressure.

For fans built to satisfy your "specs"...

Each ILG product shown carries the rating seal of the Air Moving and Conditioning Association, Inc.

you can bank on perfectly balanced fan wheels and motors

about vibration and noise. All component parts—motors and fan wheels—are dynamically balanced to make silent, safe, vibration-free operation as much a part of each piece of Ilg equipment as the "One-Name-Plate" guarantee of performance.

You can see below why it is that Ilg rates so well with men who *buy, specify* and *operate* ventilating equipment in plants of all types. For further details covering the complete line of Ilg electric ventilating equipment, send for Catalog No. 159 on propeller fans, Bulletin No. 257 on *airfoil* centrifugal fans, Bulletin Nos. 2302 and 2701 on low-in-height power roof ventilators.

ILG *power roof ventilators*

vibration-free performance

Points to Your Profit. He's pointing out that Ilg *self-cooled* motor and *patented* (Patent No. 2711682) pressure-type cooling of separate motor compartment eliminate heat build-up of *any* type. Also worth pointing out: Ilg backward curved (BC) blades and *airfoil* design for smooth, quiet air flow and low shock loss. Low housing height.

Name Your Size. Ilg propeller fan power roof ventilators give you a choice of capacities best suited to your needs, your operating budget. Eleven different sizes for exhausting as little as 87 c.f.m. to 21,100 c.f.m. Under this low-height housing operate a vibration-free, direct-connected, Ilg-built motor and patented "Q" type fan wheel—both backed by Ilg's "One-Name-Plate" guarantee.

specify ILG

ILG ELECTRIC VENTILATING COMPANY

2832 N. Pulaski Road, Chicago 41, Ill.

Offices in 57 Principal Cities

Member of Air Moving and Conditioning Association Inc. (AMCA)

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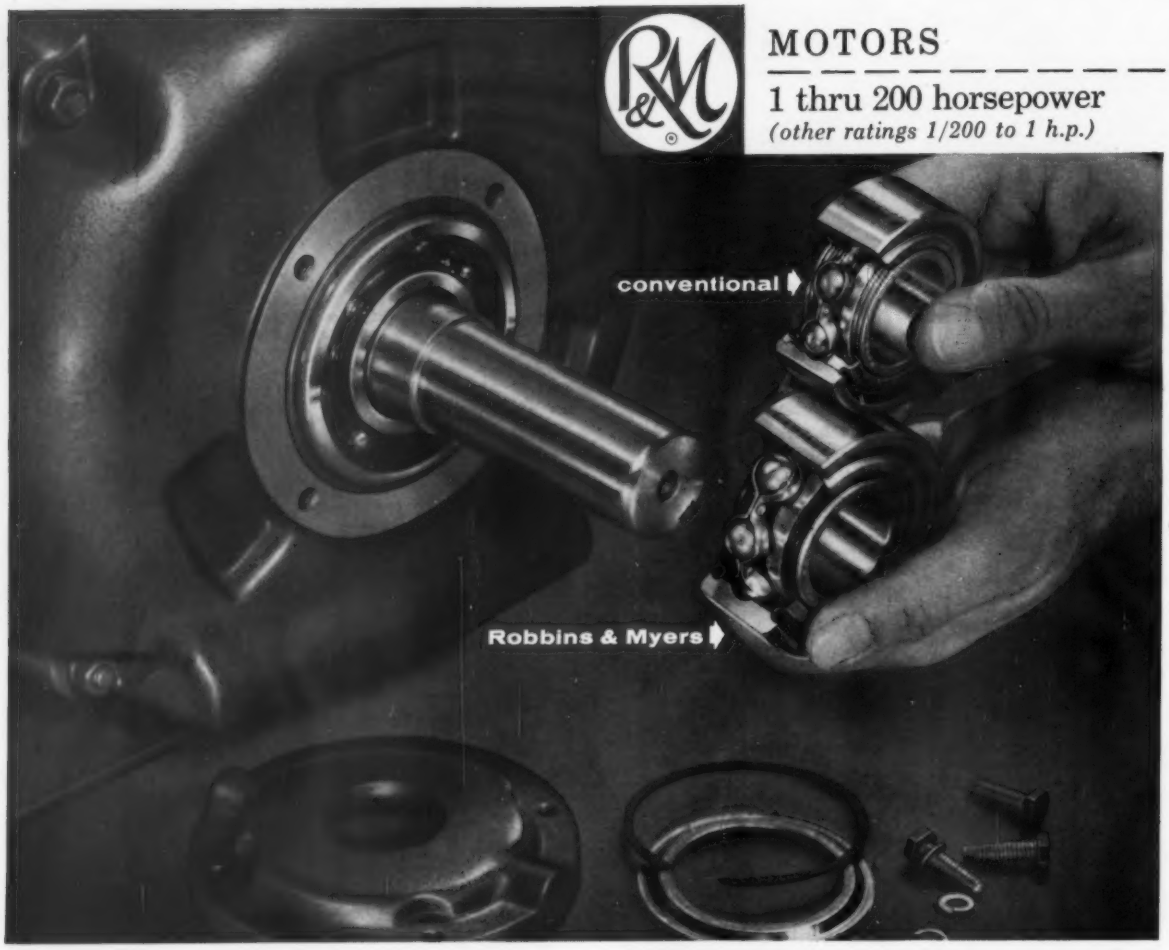
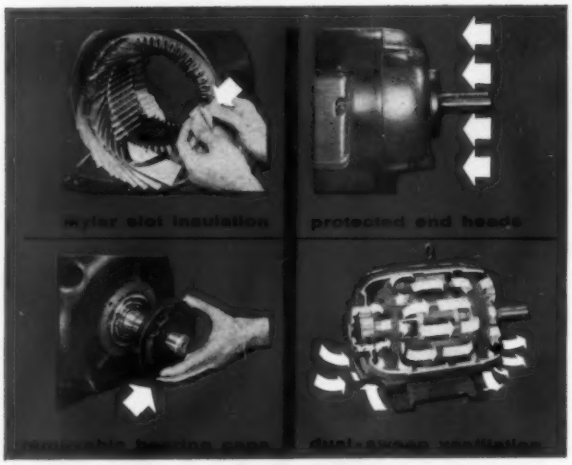


Double Width Bearings Hold More Grease...*Insure Longer Motor Life!*

Bearings in ROBBINS & MYERS motors run in double-width races with extra-large lubricant reservoirs. Bearings are fully sealed and pre-lubricated with laboratory tested grease which resists dust, temperature, humidity and high operating speeds. Tests prove these bearings can withstand six to nine years of severe service without relubrication. Bearings are further protected by metal seals on each side. Seals keep impurities out, prevent failure caused by "forgotten" lubrication or damaging over-lubrication.

R&M insures longer motor life with many additional features: Mylar* insulation that has 8 times the dielectric strength and 35 times more moisture resistance than ordinary paper insulation . . . removable caps for quick bearing inspection and relubrication . . . end heads that give full-height protection . . . dual-sweep ventilation for efficient cooling. For details, write today for Bulletin 520 PE

*DuPont registered trademark



ROBBINS & MYERS, INC.

motors, household fans, Propellair industrial fans, hoists, Moyno industrial pumps

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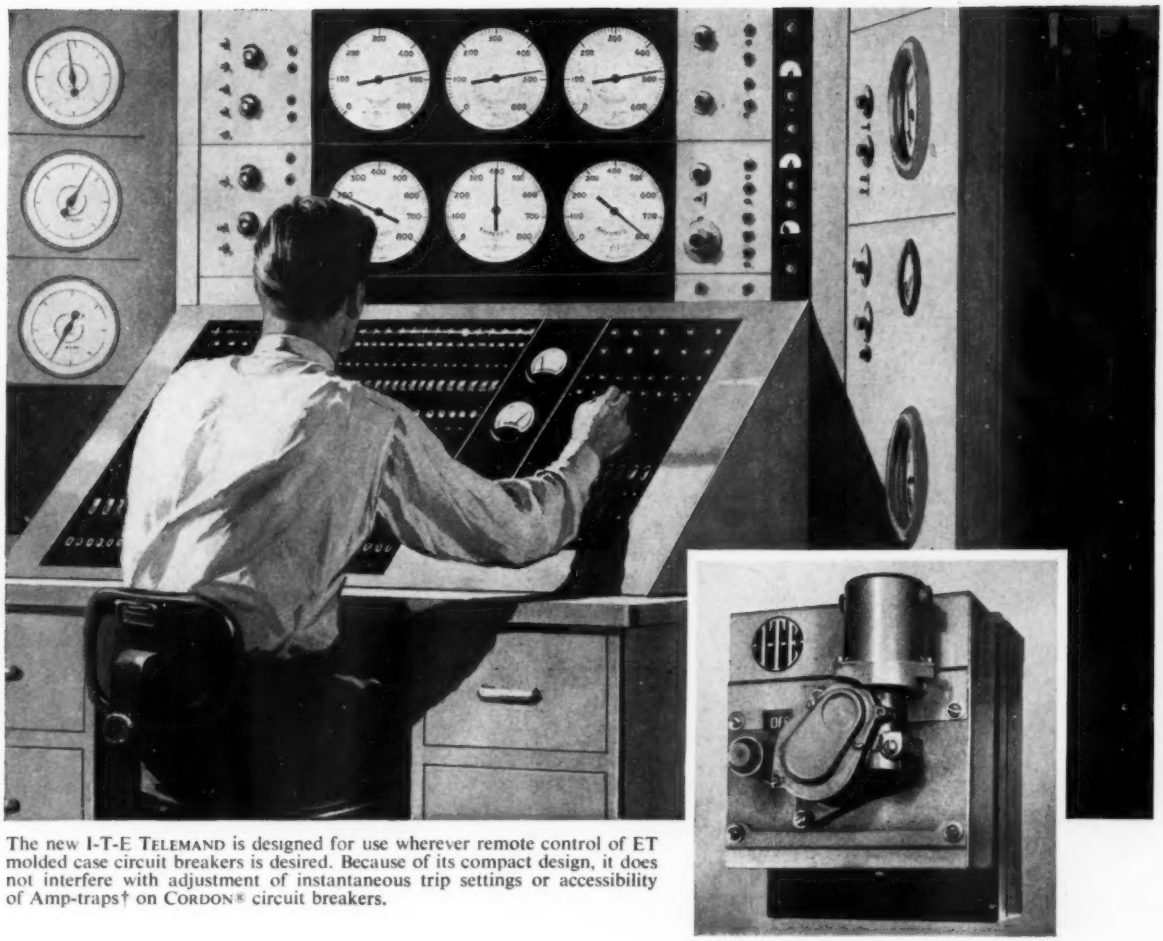


The new I-T-E TELEMAND is designed for use wherever remote control of ET molded case circuit breakers is desired. Because of its compact design, it does not interfere with adjustment of instantaneous trip settings or accessibility of Amp-traps† on CORDON® circuit breakers.

NEW EXCLUSIVE DESIGN

I-T-E TELEMAND*

Remote Control of Molded Case Circuit Breakers

I-T-E Circuit Breaker Company now offers the electrical industry another exclusive—the new TELEMAND. This I-T-E designed device is the sturdiest, most foolproof, compact and economical unit ever built for electrically opening, closing or resetting molded case circuit breakers by remote control.

Designed to fit any I-T-E molded case breaker in ratings from 70 to 800 amperes, including the CORDON® line, this unit can be installed in a matter of minutes.

I-T-E's TELEMAND is industry's first really satisfactory answer to remote control of molded case circuit breakers. In remote control applications, the I-T-E TELEMAND ET Breaker combination may be used where bulkier, more expensive equipment would be required.

It is particularly appropriate for use in automatic transfer schemes and is ideal for use as a combination switch and protective device. Write today for full details. I-T-E Circuit Breaker Co., 1900 Hamilton St., Phila. 30, Pa.

*Trademark, I-T-E Circuit Breaker Co.

†Amp-trap is a registered trademark of the Chase-Shawmut Company

I-T-E CIRCUIT BREAKER COMPANY

For more facts circle 540 on Reply Card

For more facts circle 541 on Reply Card →

Correct Lubrication in Action...

Mobil "sparks" $48,380

Workers in colorful operation shown here are filling negative plates with lead oxide. Exide Industrial Division of Electric Storage Battery Company produces batteries for widest uses from submarines to locomotives. They vary in size from 36 grams to 1,600 lbs. per cell.

Mobil

Complete Engineering Program
Proved Petroleum Products

Mobil

SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP., MOBIL OVERSEAS OIL CO., INC.

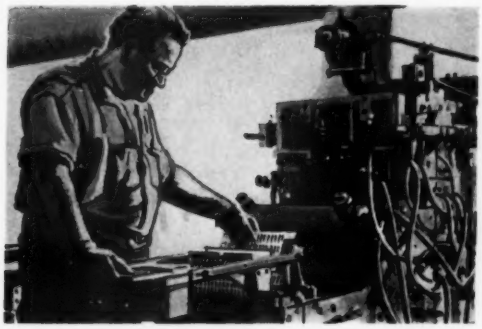
saving for Exide Battery

Here's how Exide Industrial Division of The Electric Storage Battery Company turned up new ways to cut maintenance costs, with the help of Mobil

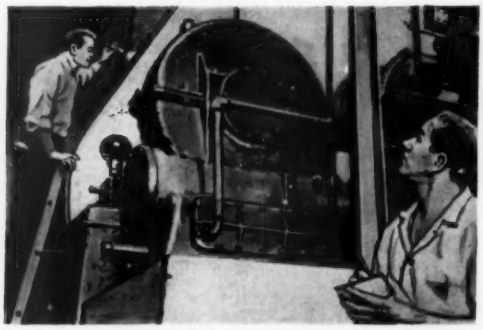
"*How can we make it better, or more efficiently?*" That's The Electric Storage Battery Company's challenging attitude. For five years now Socony Mobil has helped meet this challenge in the company's Philadelphia plant. During this period Mobil's lubrication program has saved $48,380 in maintenance costs.

Mobil's Correct Lubrication program helped put the plant's lubrication on a sound engineering basis. Every machine's needs were charted . . . rigid maintenance schedules established. Even the oilermen's routes were revised to improve efficiency. As a result, 1,256 maintenance man-hours a year are now available for other purposes. Other sizable savings are listed below.

This is *Correct Lubrication in Action.* Lubrication specialists who work closely with plant supervisors. In-plant lubrication training for maintenance personnel. Research and laboratory facilities. These services and many more are all backed by Mobil's 93 years of lubrication experience. It's helped Exide Industrial Division produce top quality batteries for less cost. It can help you cut costs, too.

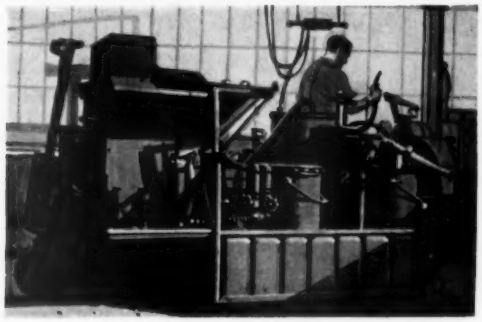


Repair of roller drive chains interrupted schedules of Grid Casting Units at five-month intervals. Mobil recommended installation of 4 gravity feed oilers with lubrication brushes that cut downtime, maintenance time, too. Saving—$8,003.



Inspection revealed abnormal wear of bull gear on grinding-mill and need for major overhaul and replacement. Mobil recommended grinding teeth, resetting gear and use of heavy, high-film strength gear oil. Gear replacement avoided—$10,000 saved.

Plate Filling Machines were being greased by hand at thirty-minute intervals. Mobil recommended automatic grease system with water-resistant Mobil product. This saved 25 man-hours per week . . . cut bearing wear rate 25% . . . has already saved $15,300.



Modern lubricating equipment, efficient routing and charts prepared for every machine in Exide's plant by Mobil engineers reduced lubrication application time 68%. Types of lubricants were cut from 25 to 10, simplifying storage and inventory.

Correct Lubrication

Another reason You're Miles Ahead with Mobil!

HONEYWELL DAMPERS—SHUTTERS

...built to your specifications for accurate, dependable air flow control

Get the *exact* shutter, damper or louver you need from Honeywell. Specify any style or type, any blade materials and setting, any edging materials, any operator-mounting arrangement. Louver, round or right angle mixing types available for pneumatic, electric or manual operation. Whatever your needs, you're assured smooth, uniform performance when you specify custom-made Honeywell shutters for dependable air flow control.

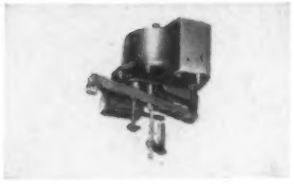
...AND SHUTTER OPERATORS

...ruggedly built for precise positioning—electric or pneumatic

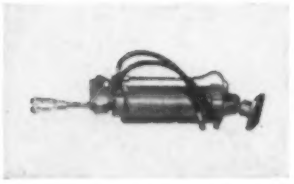
There's an electric or pneumatic motor for every shutter application in the all-inclusive Honeywell line. Two or more motors can be operated in sequence or in unison. Motors can operate two or more shutter sections, provided the combined shutter load doesn't exceed motor capacity. Available for two-position or proportioning control.

Call your nearby Honeywell field engineer for a discussion of your needs. He's as near as your phone. MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

PNEUMATIC MOTORS



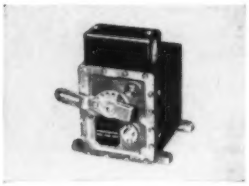
Grad-U-Motor shutter motor. Three sizes, for operating up to 48 sq. ft. of shutter area.



Heavy-duty, piston type ***Grad-U-Motor.*** For operating up to 96 sq. ft. of shutter area.

Air-O-Motor diaphragm motor. Three sizes, for operating up to 310 sq. ft. of shutter area.

ELECTRIC MOTORS



Modutrol motor operates up to 70 sq. ft. of shutter area.

Actionator operates up to 100 sq. ft. of shutter area.

Series 831E Industrial Motor operates up to 370 sq. ft. of shutter area.

Honeywell

H HONEYWELL *First in Control*

The Schlitz "headquarters" brewery at Milwaukee uses 4 pulverized coal-fired C-E boilers, Type VU, each with a capacity of 60,000 lb. per hr.

Two oil-fired C-E boilers, Type VU-10, supply 60,000 lb. of steam per hr. for process purposes at the Schlitz brewery in Brooklyn, N. Y.

This 20-million dollar showplace is the Schlitz brewery in Los Angeles, California, which uses 3 C-E boilers, Type VU-10. Fired with natural gas and oil, they generate 90,000 lb. of steam per hr.

At its Tampa, Florida, brewery, Schlitz uses 2 semi-outdoor C-E Package boilers, Type VP. They provide 72,000 lb. of steam per hr.

"The Beer That Made Milwaukee Famous"...

is brewed with C-E STEAM

Eleven C-E boiler units, ranging from the semi-outdoor, oil-fired package type to the pulverized coal-fired, vertical unit type, provide the steam to make "The Beer That Made Milwaukee Famous."

Since 1946, when the Jos. Schlitz Brewing Company purchased four C-E boilers as part of an expansion and modernization program at Milwaukee, the Company has purchased C-E units for its breweries in Brooklyn, N. Y., Los Angeles, Calif., and Tampa, Fla.

Due to the nature of brewing and bottling operations, load swings are wide and rapid, and boiler response must be both unfailing and prompt. How well C-E boilers have met this challenge is evidenced by the repeat order record—a record made even more impressive by the fact that the Jos. Schlitz Brewing Company has obtained consistently high performance with not just one type of C-E boiler — but with three.

When you need a reliable and efficient source of steam — remember that the Schlitz slogan "Move Up to Quality" applies to boilers as well as beer.

COMBUSTION ENGINEERING

C-E

C-196A

Combustion Engineering Building, 200 Madison Avenue, New York 16, N. Y.

Canada: Combustion Engineering-Superheater Ltd.

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

For more facts circle 543 on Reply Card

OPERATION AND PRODUCTION —pointers for the industrial plant engineer

Edited by Vern Kempf

Tunnel Under Railroad Embankment Permits Lift Truck Operation Between New Plant and Old

Fig. 1. Tunnel under 18-ft railroad embankment permits lift truck operation between new plant, foreground, and old.

Fig. 2. Steel sections 18-in. wide are bolted together to form underpass. Utility lines run in the dirt floor fill.

PLANS FOR a million dollar expansion program at the Paranite Wire and Cable Division of Essex Wire Corporation, Marion, Indiana, included a new warehouse. The only area available was on the opposite side of an 18-ft high railroad fill adjoining their main plant.

To make the new plant location feasible, it was necessary to install some kind of underpass through the railroad fill. An Armco liner plate structure, 14 ft in diameter and 64 ft long was selected to solve this problem. The installation was made by tunneling under the tracks and was completed without interference to railroad traffic.

In addition the structure also serves to carry utility service lines between the two plants. Four feet below the tunnel floor are water mains, steam lines, sprinkler mains, air piping and electric conduits.

Semi-Automatic Assembly Reduces Cost of Inserting Setscrews in Collars

CUTTING TIME and costs two-thirds and saving more than $4000 annually, a new high-speed setscrew inserter has replaced a trying hand assembly operation at SKF Industries, Philadelphia. Designed for lower cost assembly of setscrews in collars, the machine handles any of 11 setscrew size-length combinations and 20 different size collars.

Feeder hopper supplies constant stream of setscrews to automatic screwdriver.

Operator positions collar, presses foot pedal to automatically insert screws.

The automatic screwdriving machine, made by Standard Pressed Steel Company, Jenkintown, Pa., can be changed over quickly to permit automatic feeding and inserting of different size screws. An operator hand feeds collars to the machine. Typical production rates on a collar requiring one screw were formerly 303 collars completed per hour; now rate is 917 per hour.

Cycling automatically, the machine feeds and inserts screws as long as the operator keeps the foot pedal depressed. The operator feeds the lock collars manually, placing them against feed table holding lugs which correctly position the collar.

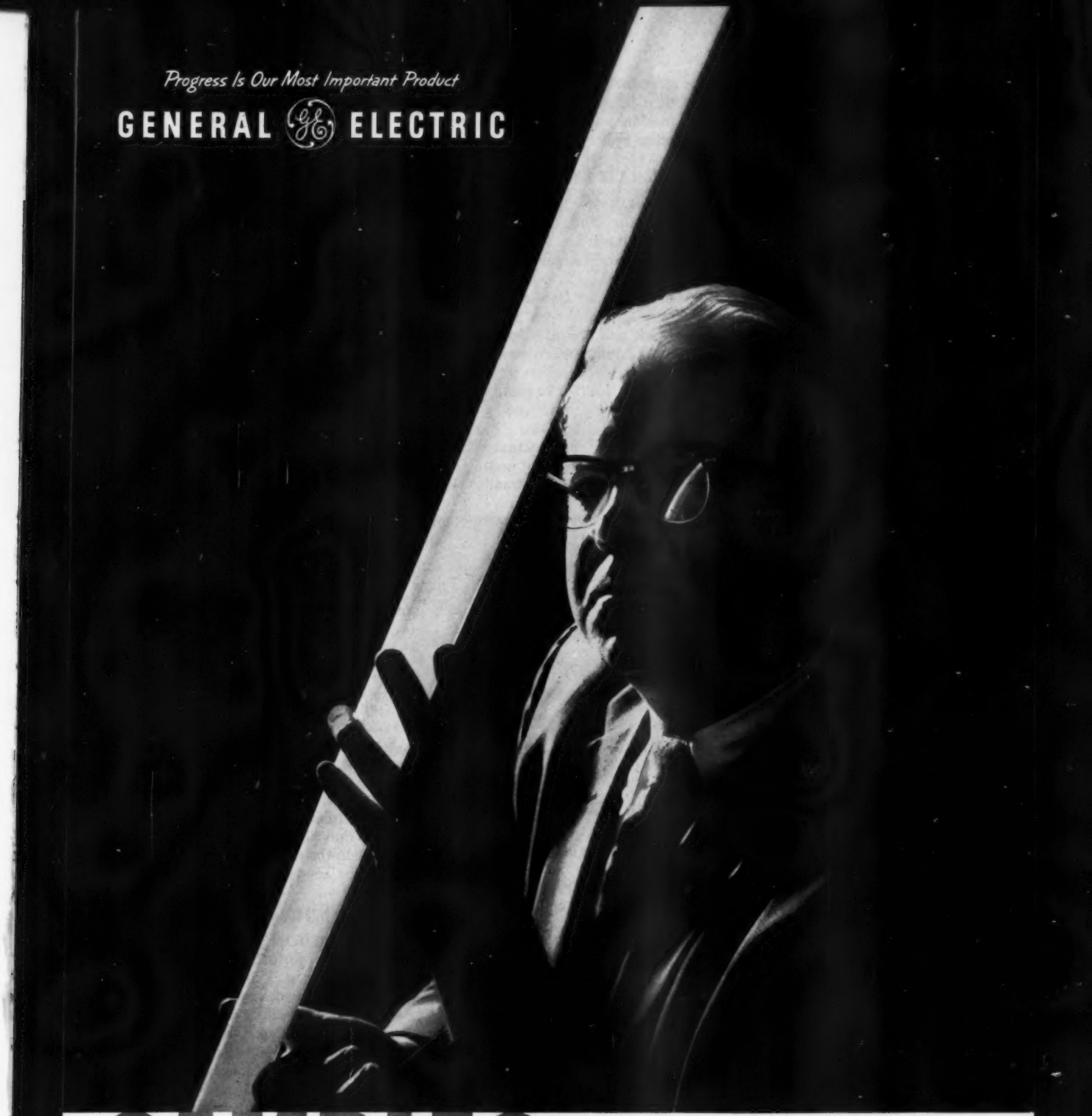
Suction Solves Stacking Problem

CHANGING the thickness of aluminum stock used to make fins for fin and tube heat exchangers

(Continued on page 62)

Progress Is Our Most Important Product

GENERAL ELECTRIC



GAMBLE?

"I think I'm about average . . . as P. A.'s go. Regular hours . . . about 10 a day. Occasionally a product comes along that makes my decision easy—like G-E Lamps. Odds are 999 out of 1,000 are sure-starters . . . 99 out of 100 will last about 2 years. And our fluorescent per-case price is less than in 1950!"

GAMBLE? "Why gamble on lamp performance when, on the average, 999 out of 1,000 G-E Lamps are free of any defect which could affect performance in our sockets!"

General Electric Co., Large Lamp Dept. C-907, Nela Park, Cleveland 12, O.

For more facts circle 544 on Reply Card

OPERATION — PRODUCTION

(O and P begins on page 60)

created a troublesome stacking problem at the Westinghouse air conditioning plant, Staunton, Va. Originally the fins were made from 13-mil-thick material which was run

Suction box supports strip until released onto guide pins during next cycle.

through a punch press die in single strips, cut to length and then gravity fed down a chute into a stacker where they were loosely aligned.

The problem arose when this material was replaced by thinner 7-mil-thick aluminum. The 7-mil fin is made by shearing multiple strips of material in the die but since the thinner material lacks rigidity and weight, stacking by the old method would not work properly.

Engineers solved the problem by determining that the new aluminum strips would drop and stack as required if there were no lateral motion of the strip at the point of drop. To create these conditions an overhead suction mechanism was adapted to the automatic punch press.

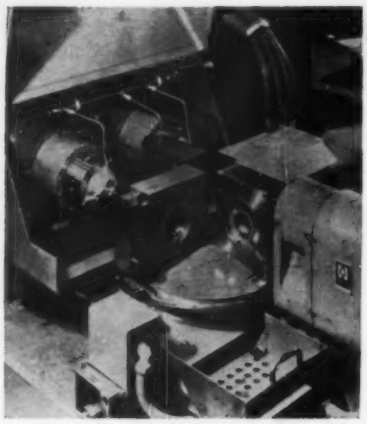
Now, after being ejected from the press, the 7-mil-thick aluminum strips are caught overhead by suction from a vacuum box, held while the press feeds the desired length of fin and are then dropped vertically as the vacuum is momentarily broken. The fins drop on guide rods until the correct number is obtained. A new set of guide rods are then indexed into position and the machine automatically begins another cycle.

This Lathe Needs No Operator

PRECISION boring, facing and grooving both ends of roll sleeves is a completely automated operation at Whitin Machine Works, Whitinsville, Mass. Parts are loaded from a chute into fixtures on a rotary table, machined on a Heald Bore-Matic and unloaded into a tote bin.

The entire operation is done without operator assistance. On each end of the cylinder part, a bore and face are finished and a recessed groove is generated. The boring heads carry quills actuated by table stroke for generating grooves.

In loading, a hydraulic plunger



Loading, machining and unloading is done without attention from operator.

inserts work from the loading chute into the collet chuck at one of four stations of the rotary fixture. The new piece ejects the finished one into a tote bin under the work table. Table travel rotates the fixture 90 degrees, presenting the work to the first boring head where one end is machined.

Next rotation takes the work to an idle intermediate station and the third indexing brings the work to the second boring head for identical operations on the other end of the part. The fourth indexing returns the work to the loading station.

Gas Analyzer Checks Aerosols

PROVIDING a reading every 10 minutes, a new gas chromatography analyzer at Pennsalt Chemical Corporation, Calvert City, Kentucky, guides operators to efficient processing of aerosol propellants.

Connected directly to the process stream only a few feet away from the control room, the Leeds & Northrup analyzer has helped operators reduce impurities in the product. Impurity levels as low as 0.01 per cent are detected.

A modified Wheatstone bridge is used in the measuring circuit

Chart records results of analysis. Programmer admits samples, advances detector output and controls chart.

with thermal conductivity cells as detectors. Stream components separate in a column and appear at the detectors as a measurable binary mixture of the component in a carrier gas.

Extremely high purity products are thus produced. This is important due to the increasing use of aerosols in the food and drug industries.

Tester Speeds Missile Checkout

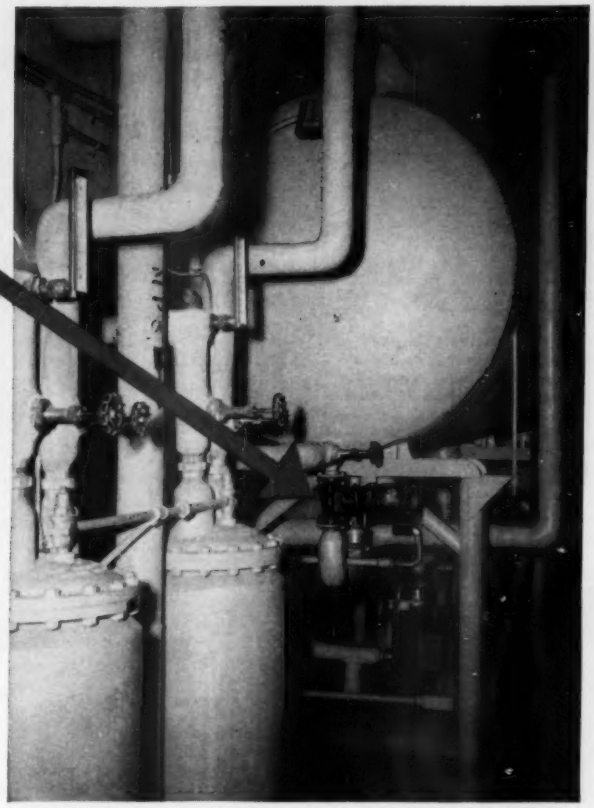
TO AID in the myriad of tests that must be performed on a missile target seeker, a complete system of automatic and semi-automatic test stands have been developed by Westinghouse Electric Corporation.

Component parts are checked in their preliminary stages to be sure that minimum and maximum tolerances are met, and to insure interchangeability of units. Then as manufacturing of the equipment progresses, combined components are checked and a final stand tests the completed system. The test equipment saves time, eliminates human errors, increases reliability and reduces cost.

(Continued on page 64)

B&G ALL-BRONZE BOOSTERS

FOR LONG LIFE IN CIRCULATING HOT OR COLD RAW SERVICE WATER FOR FAUCET OR INDUSTRIAL USES

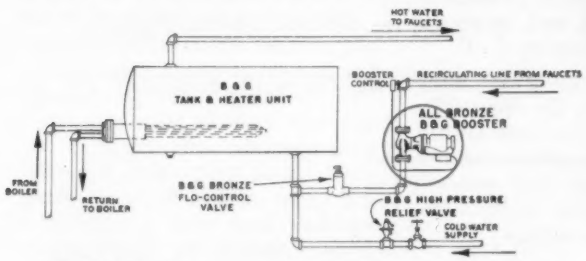


Where hot or cold service water is to be pumped, the use of an all-bronze pump is imperative. Otherwise, the corrosive effects of continuously pumping fresh water materially shortens pump life.

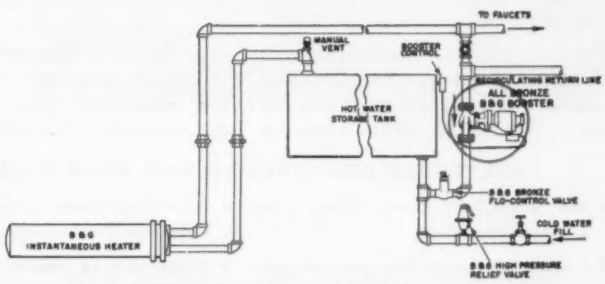
The B&G All-Bronze Booster is specifically built for service water pumping applications. In such systems, the Booster can be installed in numerous ways to step-up efficiency, increase hot water production and reduce heating costs. It is immune to corrosion, hence will give years of dependable service.

For *quiet* operation, failure-proof performance and long life, the B&G Booster is the *preferred* pump.

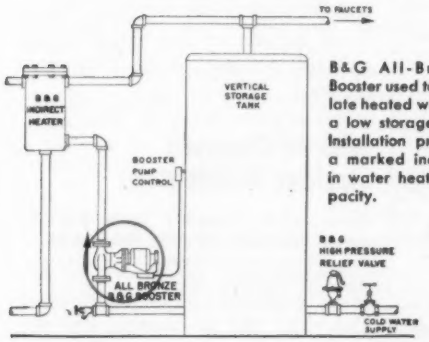
Installation of B&G All-Bronze Booster in Chrysler automatic transmission plant at Kokomo, Indiana. This small unit handles the circulating requirements of the service water heating system.



B&G All-Bronze Booster used on recirculating line from hot water faucets maintains hot water at fixtures at all times. Recommended on all installations, particularly where long plumbing lines are used.



All-Bronze B&G Booster used to provide an extra supply of hot water from an undersized boiler. Semi-tankless hook-up maintains initial supply of hot water.



B&G All-Bronze Booster used to circulate heated water to a low storage tank. Installation provides a marked increase in water heater capacity.

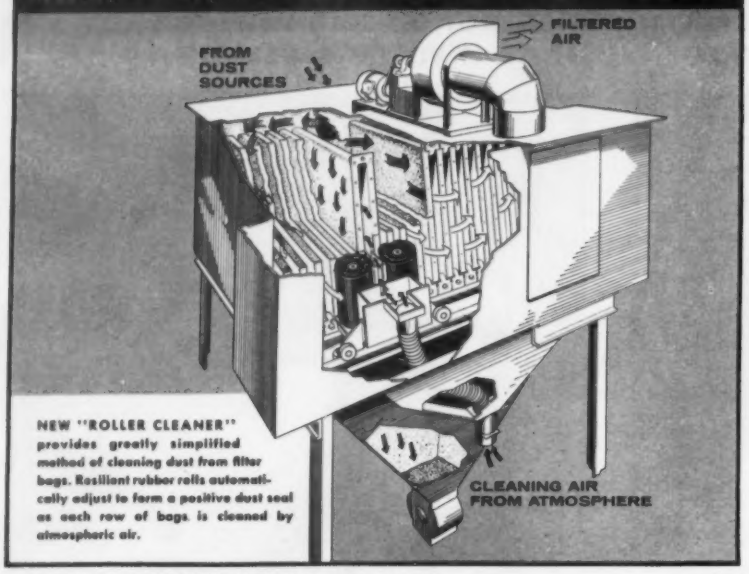
Send for Bulletin No. IA-856

BELL & GOSSETT
COMPANY
Dept. FR-53 Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

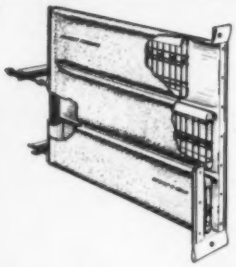
For more facts circle 545 on Reply Card

NEW SLY DYNACLONE® DUST FILTER


FROM DUST SOURCES
FILTERED AIR
NEW "ROLLER CLEANER" provides greatly simplified method of cleaning dust from filter bags. Resilient rubber rolls automatically adjust to form a positive dust seal as each row of bags is cleaned by atmospheric air.
CLEANING AIR FROM ATMOSPHERE

Patent Nos. 2583039, 2695681, 2867289. Other Patents Pending.

NOW! As Much As 3 TIMES LONGER FILTER BAG LIFE



NEW SLY "RESIST-O-WEAR" FILTER BAGS (patent pending) provide complete dust filtration with as much as three times longer life than conventional bags. This has been proved on the toughest field installations.

The new bag has three equal-size sections. Each pocket has two spacers, making a total of six per bag. Weight is distributed on three seams rather than one, minimizing strain. A special protective flap on the back end prevents abrasion from incoming dust.

Now standard in the new "Roll-Clean" Dynaclone, Sly "Resist-O-Wear" bags combine with all the other superior Dynaclone features to assure greatest dust collecting efficiency with unequalled maintenance-free service.

ALL THESE FEATURES IN ONE DUST FILTER

- New "Resist-O-Wear" bags last as much as three times longer.
- Constant suction at dust sources—complete dust collection.
- Automatically self-cleaning for continuous operation.
- Free-rolling cleaner. Complete dust seal—automatic seal adjustment.
- Greater filtering capacity; smaller space requirements.
- Simplified construction for ease of inspection and servicing.

SEND FOR New Bulletin 105 and New 36-page Dust Control Catalog 104.

SINCE 1870 SLY

THE W. W. SLY MANUFACTURING CO.

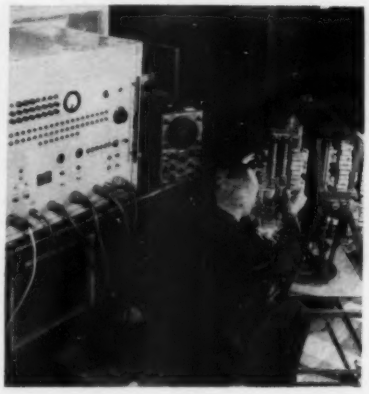
4600 TRAIN AVENUE • CLEVELAND 1, OHIO
OFFICES IN PRINCIPAL CITIES

OVERSEAS LICENSEE: ANDREW AIR CONDITIONING LTD., LONDON S.W. 1, ENGLAND

For more facts circle 546 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 60)



Tester checks combined units to pinpoint faults of assembled systems.

Any fault or error in the system can be quickly pinpointed. Each of the test stands has built-in self-test features to insure correct operation. The equipment could also be used in overhaul centers and field locations. It would allow rapid checkout of missile readiness by unskilled personnel.

Plastic Reduces Door Upkeep

Contributed by C. W. Garthwaite, Chief Engineer, McLaren General Hospital, Flint, Mich.

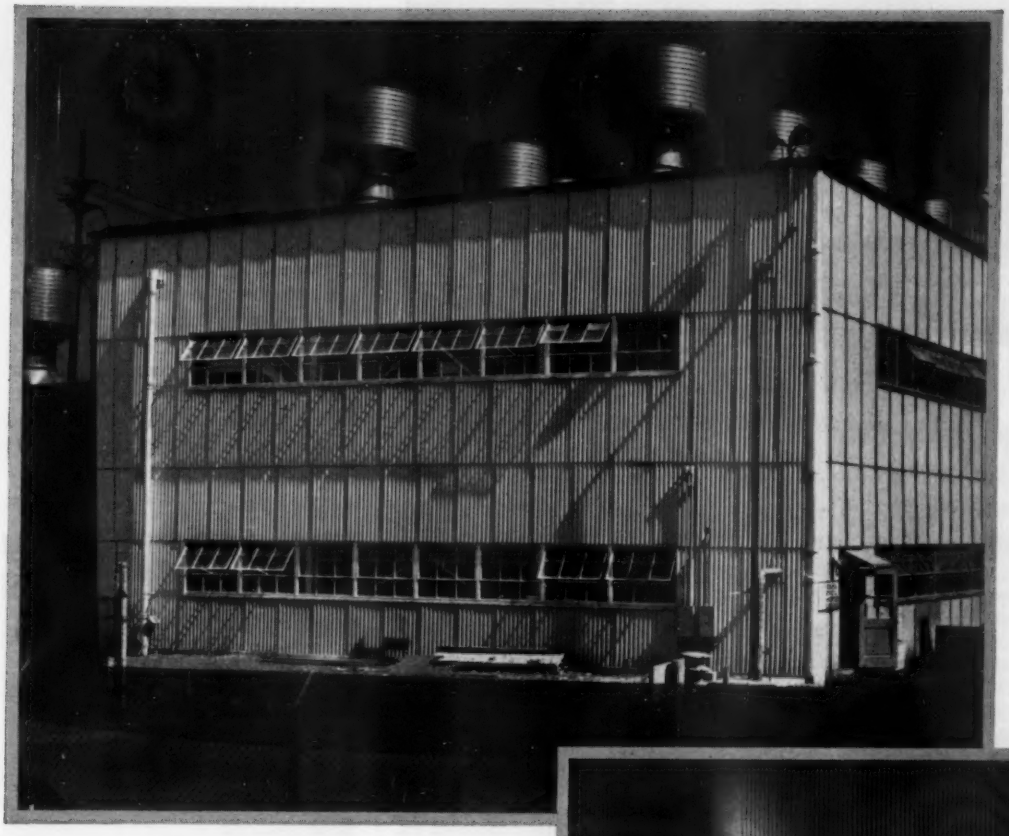
ONE OF OUR frequent maintenance chores is the repainting of doors that are finished in light colored paints. Daily washing of the area around the door knob to remove smudges soon wears the paint thin.

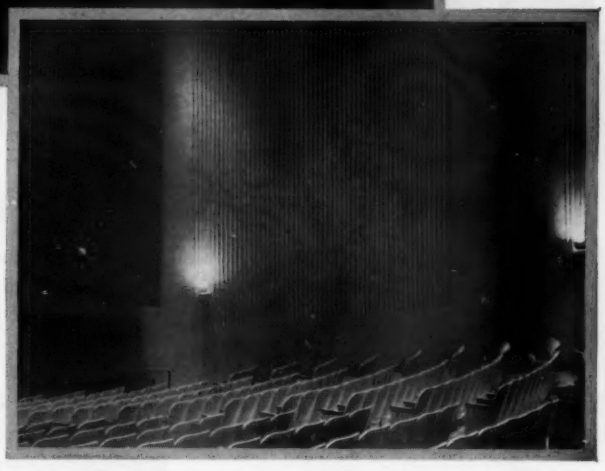
We solved this problem by applying a thin sheet of Formica around the door knob area. Applied with contact cement, the plastic panels measure nine inches by 24 in. and have been in use for several years with good results. In our case, black panels were used although these could be any of the lighter colors and still accomplish the very same results.

Quick Air Disconnect Simplifies Machine Moves

Contributed by Kenneth F. Biddle, Plant Engineer, Sundstrand Aviation, Rockford, Ill.

PRODUCTION machinery is frequently shifted to new locations in our plant due to changes and im-





Johns-Manville
CORRUGATED TRANSITE®
cuts construction costs
. . . needs no maintenance

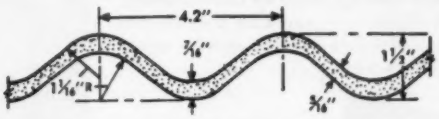
Made of two practically indestructible materials—asbestos and cement—Corrugated Transite looks and wears like stone. It actually becomes stronger and tougher with age. It can't burn, can't rot, can't rust.

Used for outside walls or roofing, Corrugated Transite is weatherproof and durable, requires practically no maintenance. Large sheets, low in first cost, require a minimum of framing, permit fast and inexpensive construction of industrial buildings as pictured above.

In the hands of an imaginative architect or engineer dramatic decorative effects can be obtained as in the case of the interior walls of the college auditorium illustrated at the right.

The natural color of Corrugated Transite is a light stone gray but it can be easily painted. Sheets can be combined with other building materials for contrast, variation or directional accent.

For a 32-page illustrated booklet, "CORRUGATED ASBESTOS TRANSITE," write to: Johns-Manville, Box 158, New York 16, N.Y. In Canada, Port Credit, Ont.



Corrugated Transite is available in sheets 42" wide (10 corrugations). Standard lengths are from 3' 0" to 12' 0" in increments of 6". Curved units are manufactured to order. Corrugated Transite may be applied to steel or wood framing.

JOHNS-MANVILLE JM PRODUCTS

JOHNS-MANVILLE

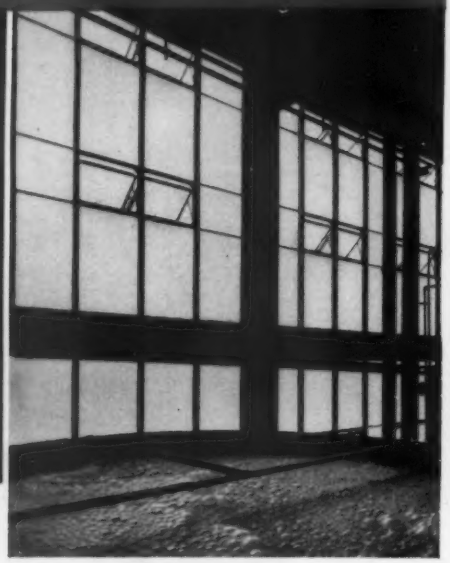
For more facts circle 547 on Reply Card

2.*
DAYLIGHTING DO's and DON'Ts
FOR COMFORT-CONSCIOUS ENGINEERS

* No. 2 of a series to help Engineers increase plant efficiency and economy.

DON'T expect to eliminate the harmful effects of "raw" sunlight through ordinary glass.

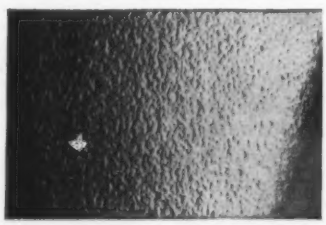
Today, most engineers realize the importance of proper factory lighting to boost efficiency and employee morale. Excess solar heat makes interiors uncomfortable . . . and blinding glare makes seeing tasks difficult and tiring.



DO INSIST ON COOLITE, HEAT ABSORBING GLASS

Blue-green Coolite, glare reduced, controls the quality of light flooding work areas, helps banish objectionable glare . . . cuts costly eye fatigue that results in seeing errors and reduces solar heat up to 50%! That's quite an order but Coolite can do all this because Coolite filters out the unwanted factors in raw sunlight to help keep interiors cooler, brighter, more comfortable.

Buy, specify, insist on Coolite Glass. Available wired and unwired at better distributors of quality glass everywhere.



Send for Coolite catalog. Address Department 13.

MISSISSIPPI GLASS COMPANY
88 Angelica St. • St. Louis 7, Missouri
NEW YORK • CHICAGO • FULLERTON, CALIFORNIA

SEE OUR CATALOG IN SWEETS — OR WRITE FOR COPY

WORLD'S LARGEST MANUFACTURER OF ROLLED, FIGURED AND WIRED GLASS

For more facts circle 548 on Reply Card

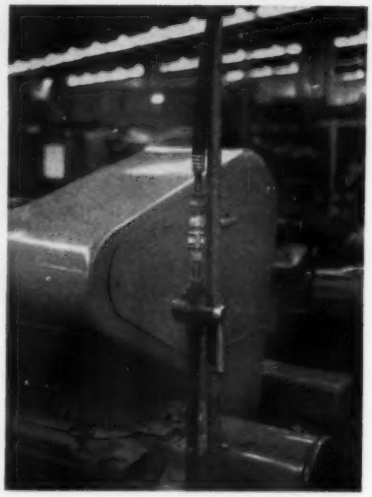
OPERATION—PRODUCTION

(O and P begins on page 60)

provements made in the products we produce. Each machine change involves disconnecting and re-connecting both electrical and compressed air supply lines.

Compressed air to each machine was run in rigid pipe from the air distribution pipes near the ceiling to the machine and connected to the floor with a drop elbow. Take-offs for air chucks and other air operated equipment were also made with rigid piping.

To reduce the amount of piping required to move a machine, a quick disconnect coupling was used just above the machine. With this system, all the piping on the machine remains in place during the move. About 30 ft of ⅜-in. black synthetic hose is used to connect the machine to the air distribution system. Now machine moves are made without disturbing any of the air piping, thus saving considerable time and labor.



Disconnect is used to connect piping on machine to air distribution system.

Air Bags Brace Marble Shipments

ONE OF THE biggest problems at the Vermont Marble Company, Proctor, Vermont, is how to ship marble so that each slab arrives at its destination in one piece. This is especially true of thin marble slabs used for facing buildings.

Practice for many years has been

Ohio plant roof "looks better than new" after QUIN-KOTE and UNIFLEX ALUMINUM COATINGS

Fawsco Manufacturing Division's careful maintenance program starts at the top—with *Quin-Kote* and *Uniflex* Aluminum Coatings, both made with ALCOA® Pigments. Fawsco's Robert J. Lange writes, "We're certainly pleased with results. Application was extremely easy and finished roofs look better than new."

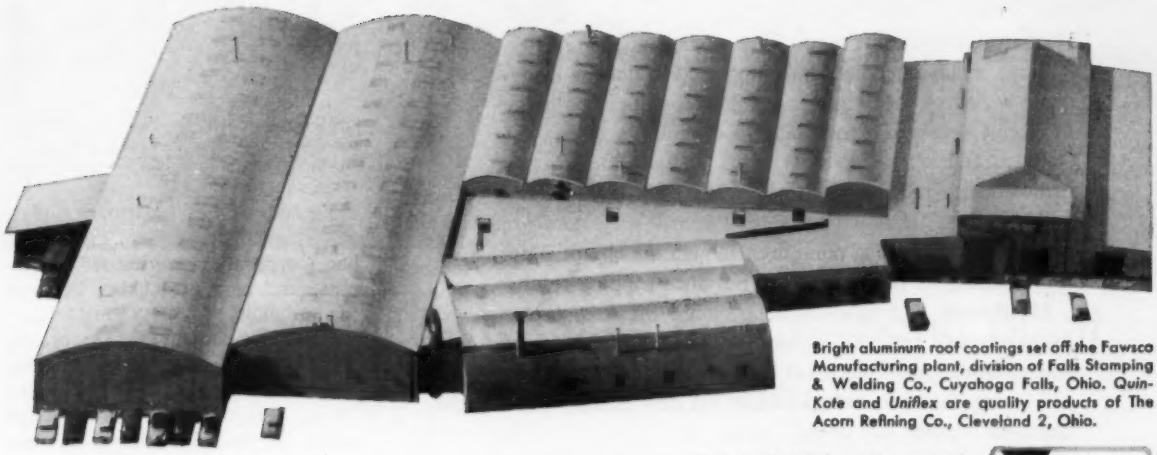
Fawsco applied *Quin-Kote* on the arched metal roofs of the plant. Especially formulated for corrugated or sheet metal roofs and siding, *Quin-Kote* applies like paint, yet is many more times more durable.

To restore "better than new" appearance to its pitched paper roofs, Fawsco used *Uniflex* Aluminum Coating, which combines ALCOA Pigment and asbestos fibers in a tough asphalt base.

Result: a major plant improvement at modest cost. Clean, bright aluminum coatings cover and seal with one application. The reflective surface turns back 70 per cent of the sun's heat, keeps interiors as much as 15 degrees cooler.

Good aluminum coatings like *Quin-Kote* and *Uniflex* offer the easiest, most economical way to make old buildings look like new—or keep new buildings staying that way. The soft, silvery finish stays attractive for years.

ALCOA does not make aluminum coatings, but we will be happy to refer you to reputable manufacturers who do. Send today for our booklets, *Painting With Aluminum* and *Aluminum Asphalt Roof Coatings Make Time Stand Still.* Use the coupon.

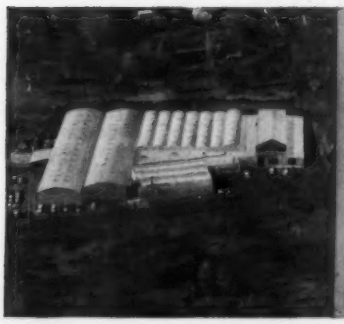


Bright aluminum roof coatings set off the Fawsco Manufacturing plant, division of Falls Stamping & Welding Co., Cuyahoga Falls, Ohio. *Quin-Kote* and *Uniflex* are quality products of The Acorn Refining Co., Cleveland 2, Ohio.

Look for this label . . . it's your guide to the best in aluminum value

ALCOA ALUMINUM

For exciting drama watch "Alcoa Theatre," alternate Mondays, NBC-TV, and "Alcoa Presents," every Tuesday, ABC-TV



Aluminum Company of America
1740-D Alcoa Building, Pittsburgh 19, Pa.

Please send your free booklets

☐ *Painting With Aluminum*
☐ *Aluminum Asphalt Roof Coatings Make Time Stand Still*

Name_____

Company_____

Address_____

City_____ Zone____ State_____

Support your local Clean Up-PAINT UP-Fix Up Campaign

GO AHEAD...

explain nuisance tripping to him

Heat's on, conditioner's out. How come?

Some annoying power interruptions are due to inadequate wiring. A vast number are due to nuisance tripping of circuit breakers or nuisance fuse blowouts.

Fuses and many circuit breakers operate on the basis of heat. They are sensitive to heat from within the circuit and without. Thus, on hot days thermal protectors are often near the tripping point even though the circuit is not fully loaded. As heat builds up, nuisance tripping results.

Heinemann hydraulic-magnetic circuit breakers *ignore heat*—respond only to *current* (amperage) which is the true determinant of electrical load. These circuit breakers will carry the full, safe capacity on the hottest days. Nuisance tripping just doesn't occur.

In Heinemann circuit breakers, actuation is entirely magnetic; inverse time delay is provided by hydraulic means. When protection is needed, interruption is fast. When the circuit is safe, power stays ON.

For consulting engineers, the full story is given in an informative booklet, Manual 101: "What You Should Know About Circuit Breakers." Write for your copy.

HEINEMANN

HEINEMANN ELECTRIC COMPANY
128 Plum Street, Trenton 2, N. J.

Circuit breakers

EA 2418

For more facts circle 550 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 60)

to stack the slabs perfectly parallel and leaning slightly against the sides of the cars. The slabs are blocked securely with wood, carefully keyed into the different lengths of slab and held in place with floor blocks and further secured with steel strapping. In addition, careful bracing between the facing stacks was required. Cost in materials and labor was substantial.

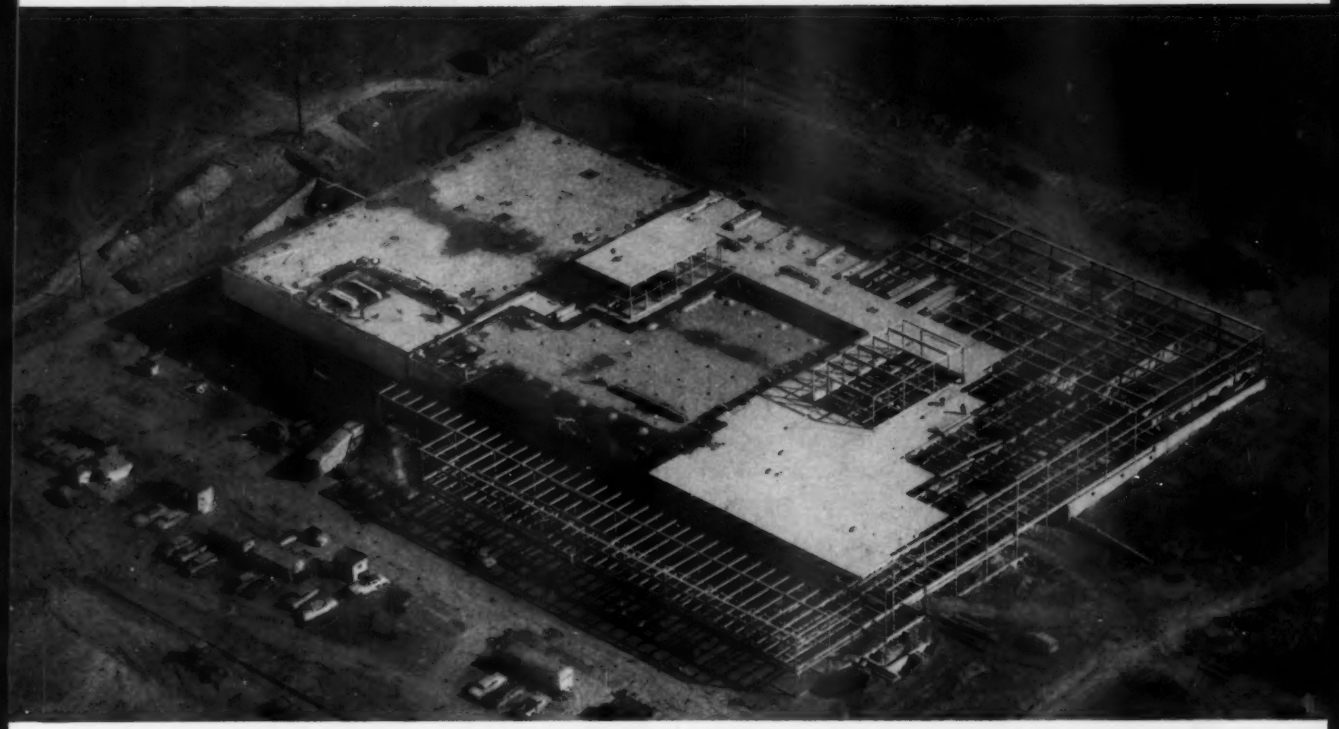
To reduce material and labor costs and damage in transit, inflatable bags made by New York Rubber Corporation were used to replace the center blocking between facing slabs. Savings in damaged shipments, while not accurately checked over a long period of time, are known to be between 50 and 75 per cent. Savings in material and labor on interplant shipments run as high as 95 per cent.

Air bags, inflated to five pounds pressure, securely brace marble shipments, eliminate center bracing formerly used.

How to Reduce Soldering Time

SPECIALLY designed and constructed, a soldering system has resulted in a 50 per cent reduction in soldering time for traction motor armatures at General Electric's Apparatus Service Shop in Chicago, Illinois. Used to solder armature coil leads to commutator bars, the system solders 50 connections in one operation taking 10 to 15 min.

Soldering equipment consists of a base holding the soldering ring, a reservoir pot for the solder, a cylin-



Steelwork for Sylvania's new Altoona plant by American Bridge

THE large and handsome building shown above is the new receiving tube plant of Sylvania Electric Products, at Altoona, Pennsylvania.

This 310′ x 400′ two-story steel-frame building provides 190,000 sq. ft. of manufacturing space—enough to replace two smaller tube plants, with room to spare.

Here again is another progressive industrial firm which plans its manufacturing facilities with an eye to the future. For, whenever it becomes necessary to further expand its Altoona operations, the steel-frame structure can be readily extended up or out to accommodate any amount of additional space.

And it can be done in any weather . . . in less time . . . with less inconvenience . . . and usually at considerably less cost with steel than with any other material.

American Bridge fabricated and erected 1,082 tons of structural steel for this job. If you would like to know more about the advantages of having American Bridge handle the steelwork for your next building, just contact any of the offices listed below.

USS is a registered trademark

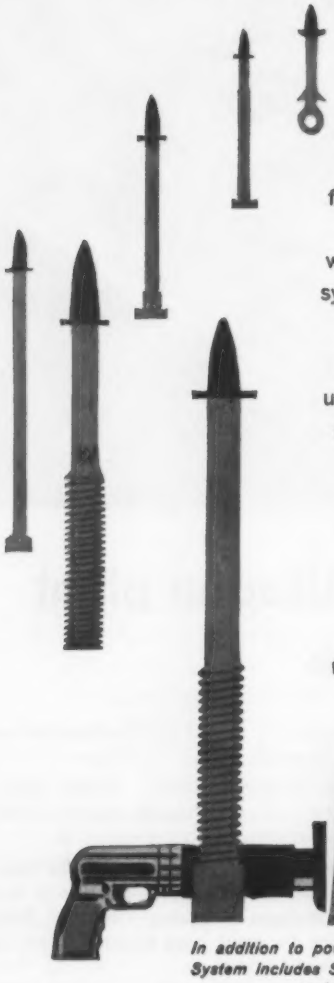
American Bridge Division of USS United States Steel

General Offices: 525 William Penn Place, Pittsburgh, Pa. Contracting Offices in: Ambridge • Atlanta • Baltimore • Birmingham • Boston • Chicago • Cincinnati • Cleveland • Dallas • Denver Detroit • Elmira • Gary • Harrisburg, Pa. • Houston • Los Angeles • Memphis • Minneapolis • New York • Orange, Texas • Philadelphia • Pittsburgh • Portland, Ore. • Roanoke • St. Louis San Francisco • Trenton • United States Steel Export Company, New York

For more facts circle 551 on Reply Card

ONLY RAMSET

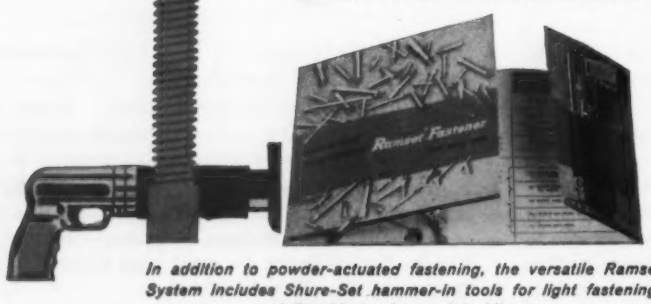
offers over 100 different powder-driven fasteners for specific jobs



Ramset, and only Ramset, offers a complete line of "job-fitted" fasteners . . . guarantees the most economical fastener for every application. Versatile Ramset is the best-known and most widely-used powder-actuated fastening system in the entire maintenance field.

In fastening to steel, concrete or masonry, Ramset tools are easiest to use . . . Ramset austempered fasteners are the best you can buy, and perform where others fail. Find out about the astounding savings . . . the absolute superiority of the Ramset Fastening System. Find your dealer's name under "Tools" in the Yellow Pages or write us direct.

Write for your copy of this handy fastener guide



In addition to powder-actuated fastening, the versatile Ramset System includes Shure-Set hammer-in tools for light fastening, and Ringblaster heavy-duty kiln gun.

Ramset Fastening System

WINCHESTER-WESTERN DIVISION • OLIN-MATHIESON CHEMICAL CORPORATION
12133-D BEREA ROAD • CLEVELAND, OHIO

For more facts circle 552 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 60)

drical displacement weight, electric immersion heaters in both the reservoir and the soldering ring and controls for the heaters and weight. The reservoir pot and immersion heaters were designed and built by the company's Industrial Heating Department, Shelbyville, Indiana.

Pure tin solder is melted in the reservoir pot by three over-the-side immersion heaters rated 1500-watts each. For actual soldering, the molten solder is passed through a trough to four 1000-watt, cast-in immersion heaters in the soldering ring. Amount and rate of solder flow in the ring is controlled by a displacement weight in the reservoir.

Used primarily for traction motor armatures, the soldering system accommodates armatures of various sizes with the use of a series of telescoping adapters.

Before the soldering operation is started, the armature is pre-heated to 300 F. Whiting is applied to the commutator to prevent solder from adhering to surfaces. The commutator is then lowered into the soldering ring and the connections are automatically soldered.

Plastic Rope Wins Hard Pull

Rope stranded from Mylar, a duPont polyester film, has helped simplify the problem of pulling heavy cables through conduit. Fiber ropes and steel cables previously used either had a short service life or damaged the conduit during the pull. On a recent project, four cables weighing more than 1200 lb were pulled through a 162-ft long, 4-in. conduit with a 3/8-in. Mylar rope.

NEW
GUTH KOLORKODED* industrial fixtures with built-in

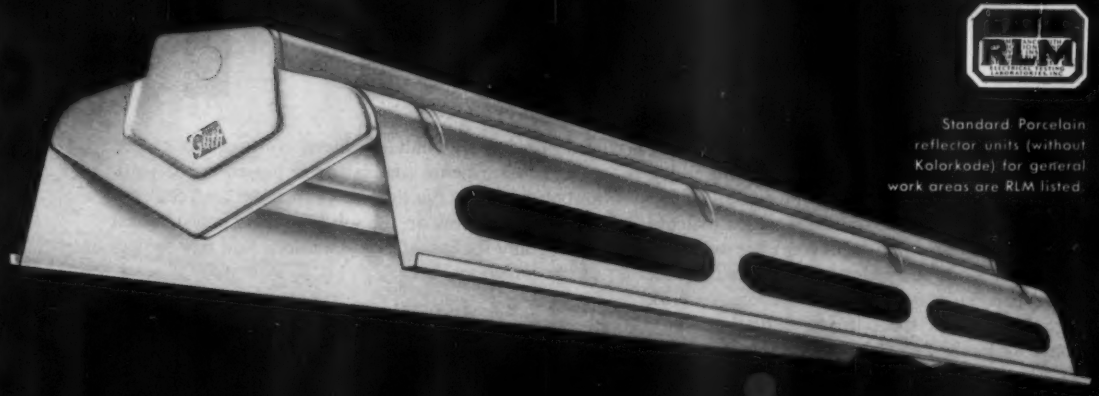
Designed to direct traffic, protect your workers, identify various plant or storage areas . . . and create new standards of seeing-efficiency for greater productivity.

They "wash away" ceiling shadows, yet assure high footcandles with comfortable shielding for the working level: 10% uplight with 13° cut-off or 25% uplight with 27° cut-off . . . for 430, 800 or 1500 M. A. operation. Easy installation and maintenance. Three reflector finishes—Permalux White, Porcelain or Alzak Aluminum.

WRITE FOR FREE KOLORKODED BULLETIN

TRAFFIC LIGHTS

*Copyright &U.S. & Can. Pats. applied for.



RLM

Standard Porcelain reflector units (without Kolorkode) for general work areas are RLM listed.

at exits, fire-protection systems, keep-out areas, etc.

at stairs, curbs, dead ends and other hazard areas.

in aisles, safe storage, first-aid, etc.

Guth LIGHTING

THE EDWIN F. GUTH CO.
2615 Washington Blvd., St. Louis 3, Mo.
TRUSTED NAME IN LIGHTING SINCE 1902

For more facts circle 553 on Reply Card

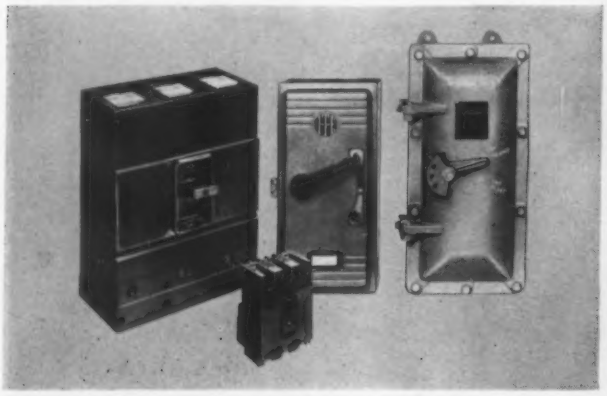
I-T-E CIRCUIT BREAKER COMPANY

SAFETY

Yes, there's real economy in fused power switching centers, but make sure you also get the *extra safety* only I-T-E offers. In every I-T-E Power Switching Center, you have the assurance of knowing that switches can be closed *even into a fault* with complete safety for both personnel and equipment. Toggle-snap quick closing prevents burned contacts. In addition, Kirk key interlocks prohibit the opening of fuse compartment doors while switches are closed.

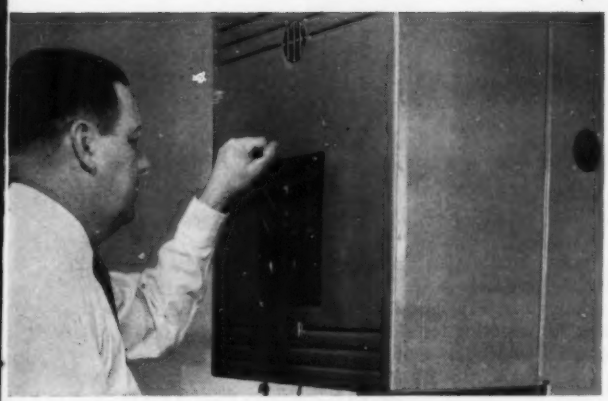
I-T-E Power Switching Centers are designed, of course, for both safety and economy. Unique I-T-E standardized cubicles and building block construction reduce engineering expense (the saving is passed on to you), and also shorten the time between order and delivery. Equipment arrives on the job in sturdy, preassembled units, ready for easy, fast installation. And new feeders can be added any time.

These extra advantages add up to greater value . . . because you pay no more for I-T-E electrical equipment. That's why it is preferred among so many companies that insist on greater value. Investigate I-T-E equipment next time you buy.



First cost is your last cost. I-T-E molded case circuit breakers not only give you vastly better protection than fused devices . . . but in most cases they actually cost you less in the long run. To restore power after a fault, all you do is flip a toggle handle. Nothing to replace. No lost time. And you're absolutely certain that you have correct protection. Choose the circuit breakers you need from the I-T-E line . . . broadest in the field. Wide variety of enclosures for both indoor and outdoor installations.

Safety for conductors. I-T-E nonsegregated phase bus, safely enclosed in metal, shrugs off the hazards of dust and weather and provides complete protection for plant personnel. Widely used for connecting transformers to switchgear and for distributing power in factories. Far easier to tap into than cable. High dielectric strength. Available in a variety of types for indoor and outdoor installations. Ratings up to 13.8 kv and 3000 amp. I-T-E nonsegregated phase bus is delivered factory fabricated for easy installation and sure fit.



Individual circuit control. Install these new URELITE individually enclosed circuit breakers right near heavy loads or as local control devices for main trunk lines up to 600 volts. Main disconnect contacts visible through side window for extra safety. Now available with I-T-E K-LINE circuit breakers . . . world's most advanced. Pulldown handle action provides quick manual make for safety and long contact life. New, wide-range overcurrent trip device lets you increase breaker setting when the load increases. No parts to replace.

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- ☐ Power switching centers
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- ☐ Metal-enclosed bus
- ☐ URELITE circuit breakers
- ☐ Other_____
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- ☐ Secondary unit substations
- ☐ TRANFO-UNITS
- ☐ CORDON® circuit breakers

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Get complete, up-to-date information on I-T-E equipment.

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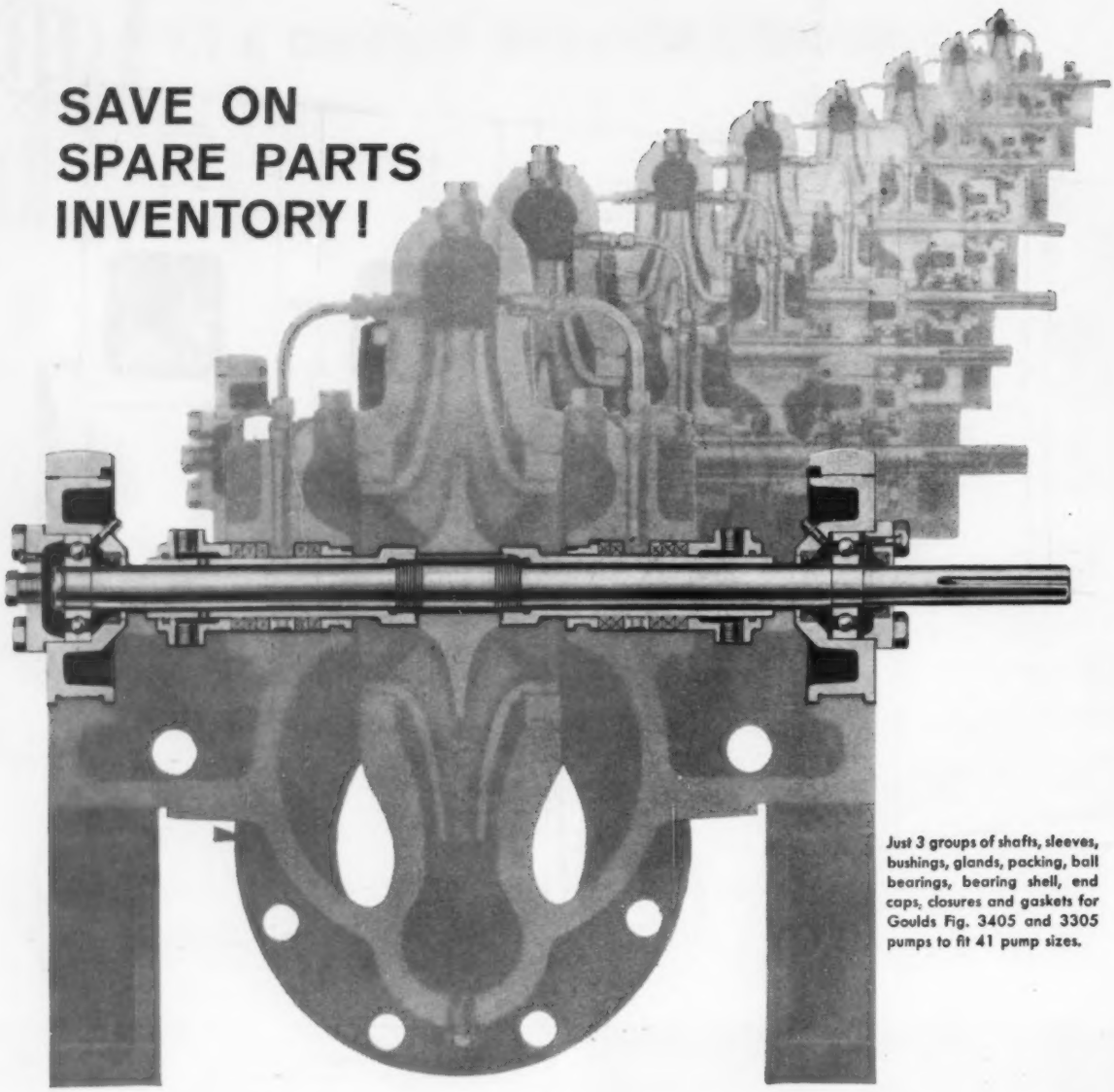
SAVE ON SPARE PARTS INVENTORY!



Just 3 groups of shafts, sleeves, bushings, glands, packing, ball bearings, bearing shell, end caps, closures and gaskets for Goulds Fig. 3405 and 3305 pumps to fit 41 pump sizes.

See how just 3 groups of parts fit 41 pump sizes!

High degree of interchangeability of parts on Goulds Fig. 3405 single-stage and Fig. 3305 two-stage Centrifugal Pumps helps you save four ways:

1. You cut down your spare parts inventory.
2. You can make changes in the field to meet new requirements.
3. Off-the-shelf delivery of standardized parts.
4. You can get lower initial cost, due to standardization of parts during manufacture.

Just three shaft and rotating parts assemblies provide for 41 sizes of these two popular pumps. You cut spare parts inventories *up to 91%*, save the cost of unnecessary overstocking.

Up to 82 pump combinations are possible—considering right- and left-hand rotation—and rotation can be changed in the field due to unique sleeve locking device (patented). Mounting dimensions and motor drive bedplates are standardized to facilitate changing without the additional expense of drilling and tapping.

And . . . you get all of this at low cost! Standard parts make manufacture less costly. Goulds passes on the savings to you.

Find out how this maximum interchangeability can save you money by sending for Bulletins 721.6 and 722.6, or ask your nearest Goulds representative.

GOULDS PUMPS, INC., Dept. PE-49, Seneca Falls, N. Y.

GOULDS

PUMPS FOR INDUSTRY

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NOW! Plan your building in color with new Alcoa Alumalure!

Alcoa adds low-cost color to the benefits of building with aluminum. New Alcoa® Alumalure lets you choose from 11 standard colors of baked enamel on aluminum building sheet. Along with aluminum's traditional advantages—light weight, corrosion resistance and economy—you'll gain the exciting appeal of color that transforms any building into a showplace. Be among the first to get the facts on Alumalure*, Alcoa's latest contribution to architecture. A telephone call to your local Alcoa sales office will bring you complete information.

FREE!

Color-Swatch Folder illustrates all 11 exciting Alumalure colors. Get it from your local Alcoa sales representative or write on your company letterhead directly to: Aluminum Company of America, 2068-D Alcoa Bldg., Pittsburgh 19, Pa.

ALCOA ALUMINUM
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Your Guide to the Best in Aluminum Value

Specify Alumalure!

**Trademark of Aluminum Company of America*

Climate by Chrysler

tames Houston's heat at Dresser Electronics Center!

"We'd need 2,400 *tons* of ice—every day—to cool the eight buildings in Dresser Electronics Center*. It takes just *four* Chrysler Centrifugal Units to do the job. And, with Climate by Chrysler, we get many other important benefits, besides.

"Reliability, for example. Chrysler engineering has developed air conditioning equipment designed for years of trouble-free service—and our first year's experience has proved it. Or, take operating costs. They're held to a minimum—thanks to unique engineering features like Chrysler's true volute compressor casing.

"Since our equipment operates winter and summer, safety is vital, too. So each of our Airtemp centrifugal units is complete with automatic purge system, oil and temperature control, and other special protective devices."

Whether your air conditioning requirement is 30 tons, or 3,000—it will pay you to get the Chrysler story. Contact your local Chrysler Applied Machinery and Systems sales office. Or write: Airtemp Division, Chrysler Corporation, Dept. V-49, Dayton 1, Ohio.

*New Houston, Texas home of Southwestern Industrial Electronics Co., a Division of Dresser Industries. Shown above: E. L. Andrews, Facility Director for Dresser Industries, Inc. *Architects:* Pierce & Pierce. *Consultants:* Bernard Johnson & Associates; Weldon W. Henderson, Consulting Engineer.

CHRYSLER AIRTEMP

FIRST WITH THE FINEST IN AIR CONDITIONING

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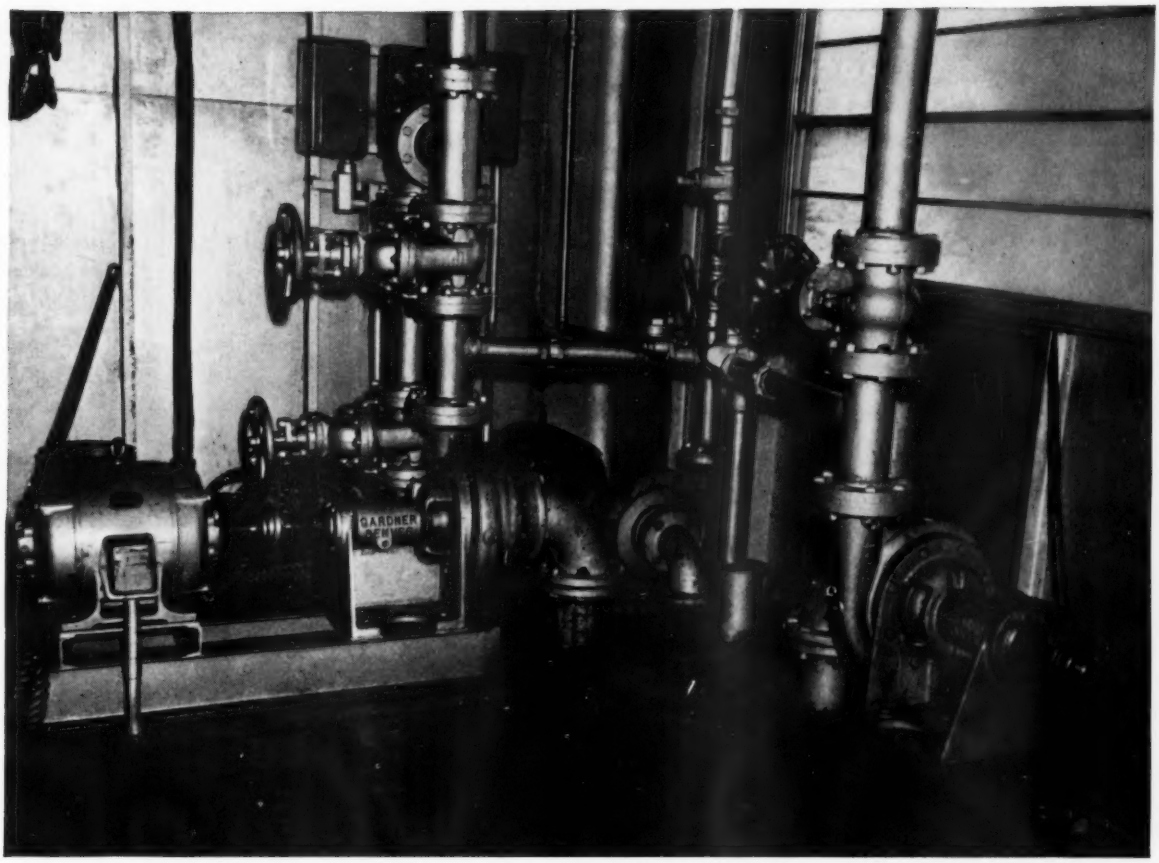
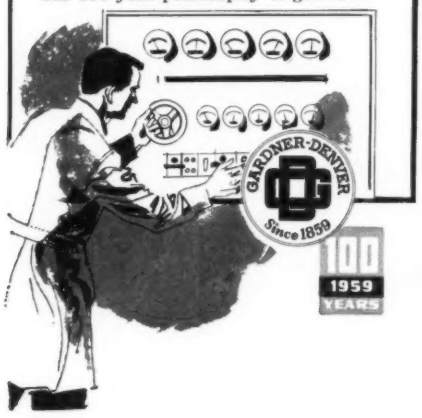


Your Gardner-Denver pump specialist has a quality pump for heads up to 300 ft.—for capacities up to 2000 g.p.m. See him soon.

All set for efficient pumping though heads may change...and volume, too

TESTING NEVER ENDS

Superior product performance is never an accident. Skilled Gardner-Denver men continually test Gardner-Denver equipment against rigid specifications to insure uniformly high quality in product after product. At Gardner-Denver *there's no substitute for men*—our 100-year philosophy of growth.



Gardner-Denver centrifugals deliver peak performance over a broad range of service conditions . . . take variations in head or volume efficiently. Available in a wide range of sizes—to handle a wider-than-usual range of capacities and pressures. Ask your Gardner-Denver pump specialist to help select the best centrifugal for your application, or write for bulletin.

- Extra large shafts to assure continual alignment.
- Heavy-duty ball bearings.
- Casing of high-strength alloy iron produces gradual velocity changes for smooth flow, better efficiency.
- Mechanical seal for long life without attention.
- Hydraulically balanced impellers.

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois

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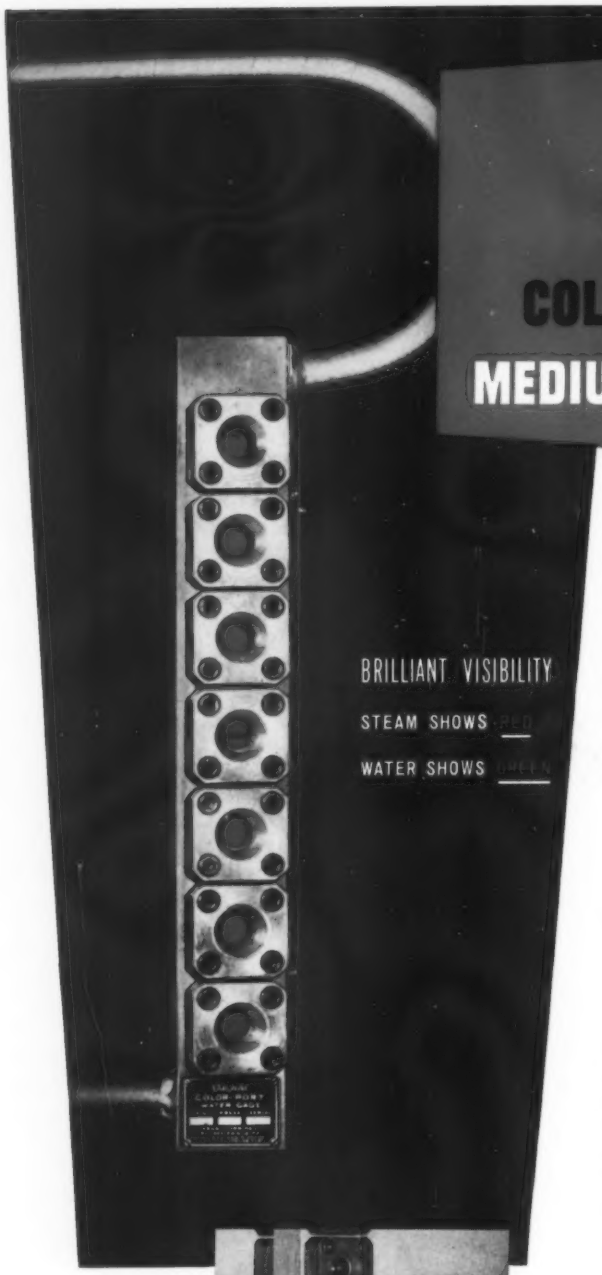
NEWS FROM YARWAY



now!

A NEW YARWAY COLOR-PORT GAGE FOR MEDIUM PRESSURE BOILERS

The Yarway Color-Port Water Level Gage, so outstandingly successful on high pressure boilers, is now available in a new model designed especially for boilers operating up to *1050 PSI.*

Yarway Color-Port gives you all these *triple advantages:*

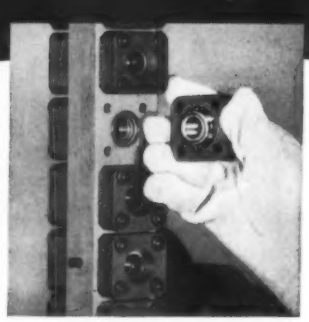
- *Two color readings*, brilliant and clear. Water shows green; steam shows red. A full gage is all green; an empty gage all red.
- *Low maintenance.* Servicing the Color-Port is simple as A-B-C. With gage remaining in place, individual cover plate assemblies can be inserted in a matter of minutes. Exclusive spring loading maintains proper pressure on glasses and gaskets at all times.
- *Increased operational time.* Yarway Color-Port Gages assure longer operational life, with a minimum of "time out" for maintenance.

Replace troublesome water level gages with the new medium pressure Yarway Color-Port—and for your new boilers, make sure the specifications read YARWAY COLOR-PORT. Visibility ranges of *13"*, *15½"* and *18"* available.

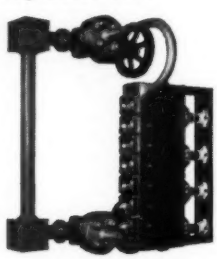
Free descriptive Bulletin WG-1815 on request.

YARNALL-WARING COMPANY
145 Mermaid Avenue,
Philadelphia 18, Pa.

BRANCH OFFICES IN PRINCIPAL CITIES



Complete cover plate assemblies can be replaced in minutes, with the gage in place.



Complete Color-Port assembly, with tie-bar column, Welbond Gage Valves and Yarway Illuminator.

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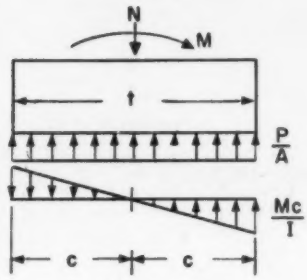
CONSTRUCTION BRIEFS —a review of fundamentals for the plant engineer

Prepared by B. A. Wasil, Structural Engineer

DESIGN OF REINFORCED CONCRETE COLUMNS II—COMBINED AXIAL LOAD AND BENDING

WHEN A HOMOGENEOUS COLUMN is subjected to combined axial load and bending, we note that the stress condition can be considered to be the sum of that due to an axial load and that due to a moment. Thus, the extreme fiber stresses are:



$$f = \frac{N}{A} \pm \frac{Mc}{I}$$

where compression in this case is considered positive, A is the cross-sectional area and I the moment of inertia.

If $\frac{Mc}{I} > \frac{N}{A}$ then there will be tension over part of the cross-section of the column; if $\frac{Mc}{I} \leq \frac{N}{A}$ there will be compression over the entire cross-section of the column.

In the case where compression exists over the entire cross-section of the column, we may be able to use the very simple principles developed previously for reinforced concrete columns.

Any combination of vertical loads and moments on a column can be converted to a single axial load, N, and a single moment, M. In turn, any axial load, P, and moment, M, is statically equivalent to an eccentric load, N, placed a distance from the center of the column in the direction of the moment, $e = \frac{M}{N}$

As an example, if the illustration above for a homogeneous member were a rectangle, b x t, then

$$f = \frac{N}{bt} \pm \frac{Net}{2 \cdot \frac{bt^3}{12}} = \frac{N}{bt}\left[1 \pm \frac{6e}{t}\right]$$

and for the cross-section always to be in compression, $e/t \leq 1/6$.

In reinforced concrete, cognizance is made of plastic flow and it is permissible to design and analyze columns as if compression existed across the entire cross-section as long as $e/t \leq 2/3$.

We have already noted that when we design beams for bending, the allowable compression stress is $0.45\ f'_c$ and when we design axially-loaded columns, the nominal allowable stress is $(0.225\ f'_c + f_s p_g)$ for spiral columns and 0.8 times this value for tied columns.

To account for the difference in allowable stresses, the interaction formulas are used:

$\frac{f_a}{F_a} + \frac{f_b}{F_b} \leq 1$ for bending on one principal plane

$\frac{f_a}{F_a} + \frac{f_{bx}}{F_b} + \frac{f_{by}}{F_b} \leq 1$ for bending in the two principal planes

Where $f_a = \frac{N}{A_g}$,

$F_a = 0.225\ f'_c + f_s\ p_g$, for spiral columns

$F_a = 0.8\ (.225\ f'_c + f_s p_g)$, for tied columns

$f_b = \frac{Mc}{I}$; $f_{bx} = \frac{M_x c_x}{I_x}$; $f_{by} = \frac{M_y c_y}{I_y}$

$F_b = 0.45 f'_c$

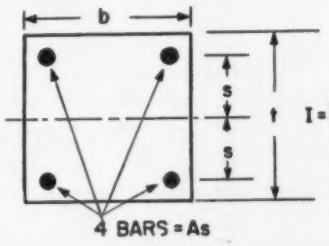
A_g = gross cross-sectional area of the concrete

c = largest distance from the center of gravity to the extreme fiber in the direction of the moment.

I = moment of inertia of the transformed section about the center of gravity in the direction of the moment.

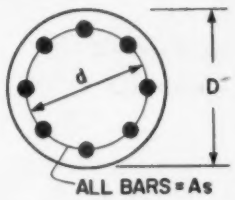
The Transformed Section

The idea of the transformed section requires further explanation. The transformed section is a fictitious section, of concrete only, that will deform identically under load as would the reinforced concrete section. For a column whose cross-section is completely in compression, the transformed section is made up of the gross section of concrete plus area (n—l) A_s in place of the steel. As an example, the moment of inertia of the tied column is:



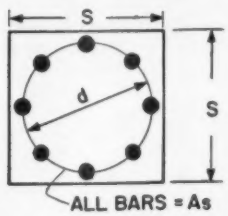
$$I = \frac{bt^3}{12} + (n-1)\,As\,g^2$$

The moment of inertia for a circular spiral column is:



$$I = \frac{\pi D^4}{64} + \frac{(n-1)\,As\,d^2}{8}$$

The moment of inertia for a square spiral column is:



$$I = \frac{S^4}{12} + \frac{(n-1)\,As\,d^2}{8}$$

The methods developed thus far allow only for a check on the capacity of a column in bending. In other words, a column must first be proportioned; then, with the methods shown above, checked to see whether it is a

satisfactory section. The following equation provides a rapid and accurate method of establishing a trial section for a column subject to axial load and bending.

$$P = N\left(1+\frac{Be}{t}\right)$$

P is an equivalent axial load, designed as described in the previous Brief.

B is a factor to be taken from 3 to 3.5 for rectangular tied columns, the lower value used for columns with minimum reinforcement, and 5 to 6 for spiral columns.

Design of a Spiral Column

Governing Data

$N = 150$ kips
$M = 50$ ft-kips
$f'_c = 3000$ psi
$f_s = 20{,}000$ psi
$n = 10$

Trial Section

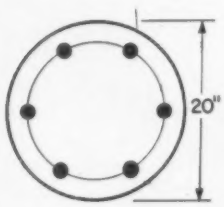
$e = \frac{50 \times 12}{150} = 4$ in. Assume $p_g = .01$

$P = A_g\left(0.225\, f'_c + f_s p_g\right) = N\left(1+\frac{Be}{t}\right)$

$\frac{\pi D^2}{4}\left[875\right] = 150{,}000\left[1+\frac{5 \times 4}{D}\right]$

$D^3 - 218D - 4370 = 0$

$D = 20.7$ in.



Try $D = 20$ in.

$A_g = \frac{\pi D^2}{4} = 314$ in.

$A_s = .01 \times 314 = 3.14$ in.

Use six No. 7 bars

$A_s = 3.60$ in.

$p_g = \frac{3.60}{314} = .01147$

Assuming No. 3 spiral and 1½-in. clear spacing, $d = 15.38$ in.

Check

$f_a = \frac{150{,}000}{314} = 478$ psi

$F_a = [.225 \times 3000 + 20{,}000 \times .01147] = 904$ psi

$I = \frac{\pi \times 20^4}{64} + \frac{(10\text{-}1)\ 3.60 \times \overline{15.38}^2}{8} = 8810$ in.^{4}

$f_b = \frac{50{,}000 \times 12 \times 10}{8810} = 681$ psi

$F_b = 0.45 \times 3000 = 1350$ psi

$\frac{f_a}{F_a} + \frac{f_b}{F_b} = \frac{478}{904} + \frac{681}{1350} = 1.033 > 1.00$

Very close, but not sufficient. The next larger column size of 22 in. with a corresponding increase in steel to bring the percentage to .01—or just an increase in steel percentage—is called for.

Trial Section

Try using seven No. 7 bars.

$A_s = 4.20$ in.^{2}

$p_g = \frac{4.20}{314} = .01328$

$f_a = 478$ psi

$F_a = [.225 \times 3000 + 20{,}000 \times .01328] = 941$ psi

$I = \frac{\pi \times 20^4}{64} = \frac{(10\text{-}1)\ 4.20 \times \overline{15.38}^2}{8} = 8970$ in.^{4}

$f_b = \frac{50{,}000 \times 12 \times 10}{8970} = 668$ psi

$F_b = 1350$ psi

$\frac{f_a}{F_a} + \frac{f_b}{F_b} = \frac{478}{941} + \frac{668}{1350} = 1.002$

This slight overstress will be neglected.

The design of the reinforcing spirals will follow that shown in the previous Brief.

Design of a Square Tied Column

Governing Data

$N = 150$ kips
$M_x = 37.5$ ft-kips
$M_y = 37.5$ ft-kips
$f'_c = 3000$ psi
$f_s = 20{,}000$ psi
$n = 10$

Trial Section

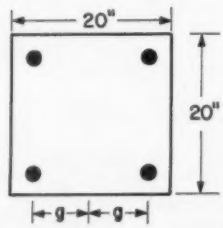
$e_x = e_y = \frac{37.5 \times 12}{150} = 3$ in. Assume $p_g = .01$

$P = .8A_g\left(.225f'_c + f_s p_g\right) = N\left(1+\frac{Be_x}{t_x}+\frac{Be_y}{t_y}\right)$

$.8t^2\left[875\right] = 150{,}000\left[1+\frac{3 \times 3}{t}+\frac{3 \times 3}{t}\right]$

$t^3 - 214t - 3860 = 0$

$t = 20.14$ in.



Try $t = 20$ in.

$A_g = 400$ in.^{2}

$A_s = .01 \times 400 = 4.0$ in.^{2}

Use four No. 9 bars

$A_s = 4.0$ in.^{2}

$p_g = \frac{4.0}{400} = .01$

Assuming No. 3 ties and 1½-in. clear spacing, $g = 7.58$ in.

Check

$f_a = \frac{150{,}000}{400} = 375$ psi

$F_a = .8\ [.225 \times 3000 + 20{,}000 \times .01] = 700$ psi

$I = \frac{\overline{20}^4}{12} + (10\text{-}1)\ 4.0 \times \overline{7.58}^2 = 16{,}400$ in.^{4}

$f_{bx} = \frac{37{,}500 \times 12 \times 10}{16{,}400} = 274$ psi

$f_{by} = \frac{37{,}500 \times 12 \times 10}{16{,}400} = 274$ psi

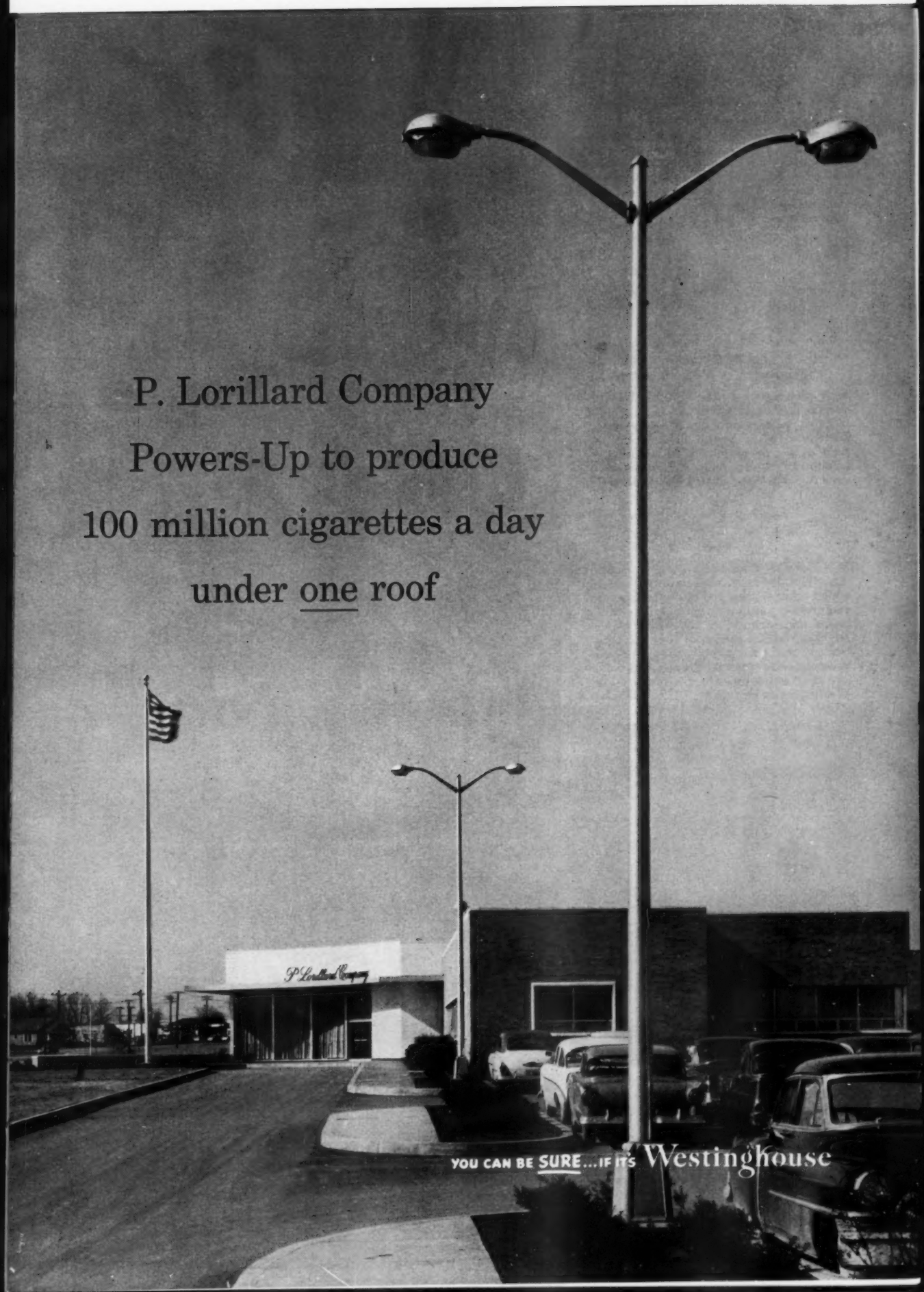
$F_b = 0.45 \times 3000 = 1350$ psi

$\frac{f_a}{F_a} + \frac{f_{bx}}{F_b} + \frac{f_{by}}{F_b} = \frac{375}{700} + \frac{274}{1350} + \frac{274}{1350} = 0.942 < 1.0$

This is satisfactory.

It should be noted that for both illustrations used here, the values of e/t are much smaller than the limiting value 2/3. This is the more usual case for ordinary building columns. Should e/t exceed 2/3, then an analysis based on the recognized cracked section theory shall be used and the extreme fiber stress in compression shall not exceed 0.45 f'_c and the steel stress not to exceed its allowable in tension and compression. The analysis by cracked section theory is involved and will not be shown here, because it is a departure from usual design.

However, many texts and handbooks contain charts for simple solution of this problem.


P. Lorillard Company
Powers-Up to produce
100 million cigarettes a day
under one roof
YOU CAN BE SURE...IF IT'S Westinghouse

FRONT COVER

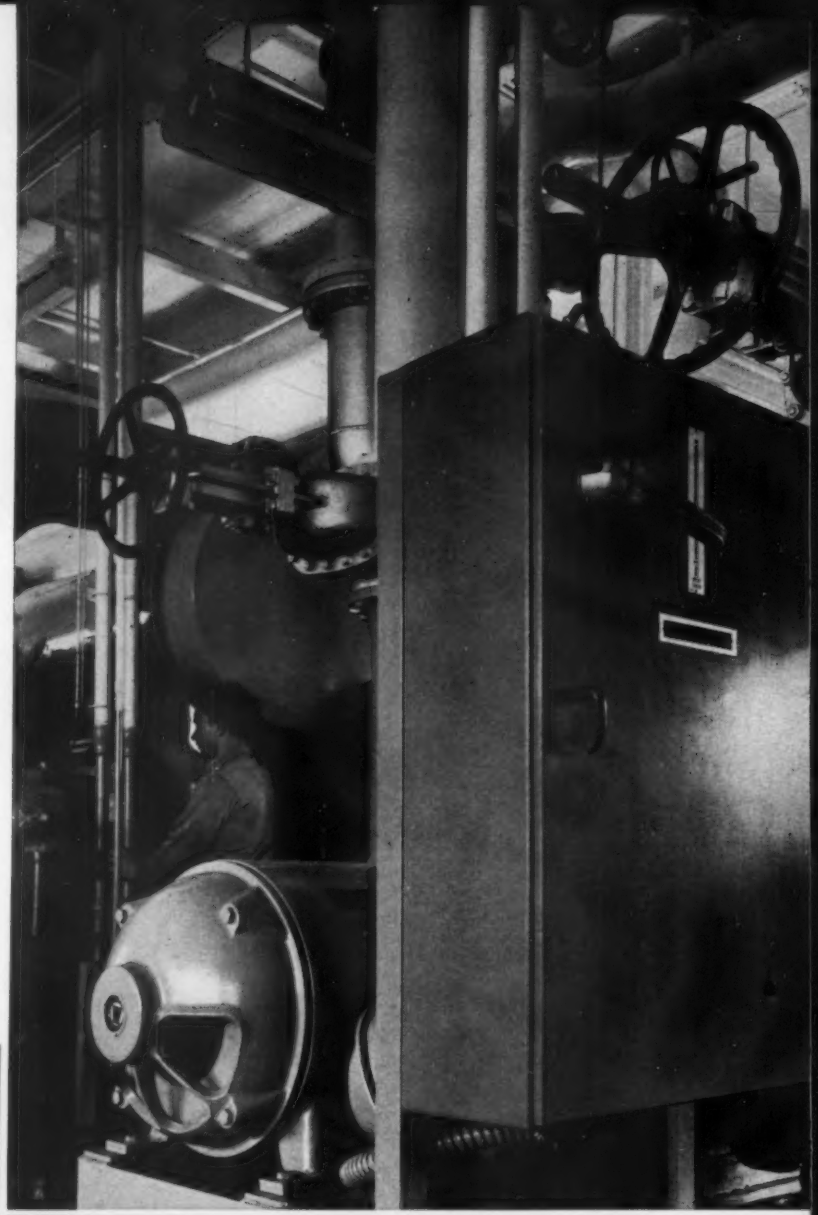
The completely new "electromated" Greensboro, N. C. branch of the P. Lorillard Co. is designed for tomorrow's expansion, both in power and plant layout, as well as for today's immediate production needs. Westinghouse type OV-20 outdoor lighting is used for the building approach and 650-car parking area.

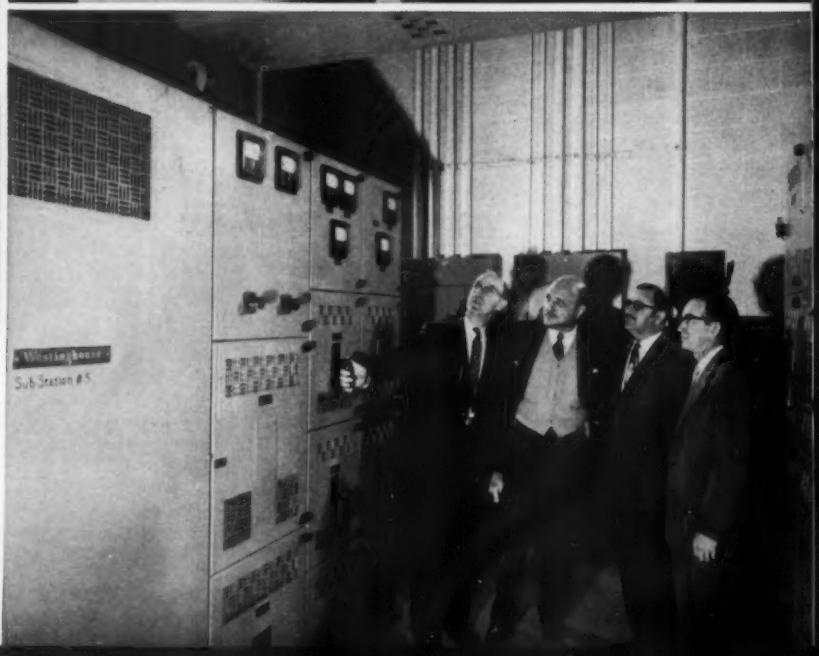
▶ A Westinghouse class 11-404 reduced-voltage starter provides automatic starting and protection for the Westinghouse Life-Line® 60-hp motor. The motor is part of a system which automatically controls the "man-made" climate, so necessary in the cigarette-making industry.

▼ A Lorillard maintenance man inspects the class 11-400 reduced-voltage starter which controls the 200-hp Life-Line air compressor motor supplying air to safeguard instruments. A 400-amp, 600-V, AHF-355 safety switch is shown in the background. On the wall (right) are two Westinghouse class 11-404 reduced-voltage starters providing protection for Westinghouse motors.

▶ O. B. Van Hise, Lorillard Plant Engineer; Wm. Folk, Jr., Westinghouse Sales Engineer; J. E. Guill of Starr Electric Co., Inc., Electrical Contractors and Engineers; H. L. Coble, H. L. Coble Construction Co., General Contractor, examine one of the plant's nine dry-type power centers. Power centers have spare circuit breakers plus blank cubicles equipped for future power needs. Overhead bus duct serves as tie-run between power centers.

J-94115-2





Westinghouse electrical equipment used for today's production and tomorrow's expansion

P. Lorillard Company, the nation's oldest tobacco firm, is now occupying the newest and most modern cigarette manufacturing plant in the country. Relying heavily on Westinghouse equipment, the ultra-modern Greensboro, North Carolina plant is electrically powered to expand capacity or to shift emphasis from filters to non-filters (or vice versa) almost overnight.

The plant is unique in the tobacco industry not only in design, but because it represents many departures from standard industry procedure. In some instances, departures were so great that new, complex machinery was designed and built.

Power is transmitted to the completely "electromated" plant at 22,000 volts and stepped down by Westinghouse transformers to 12,500 volts and distributed to nine power centers throughout the plant. These network power centers distribute 480/277 volts and are interconnected to avoid shutdown in the event of a partial power failure.

Lorillard minimized human error and bolstered production by installing Westinghouse-driven and controlled automatic feeder-conveyors to move the processed tobacco in a steady flow above cigarette-making machines, feed it into the machines and automatically maintain the precise level of tobacco in hoppers. This system assures uniform filling and quality of every cigarette.

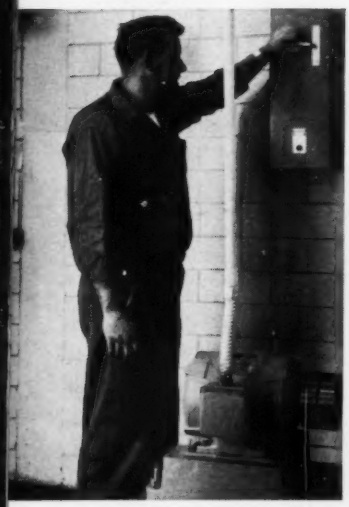
In addition to the substation transformers and electrical equipment for the conveyor system, Westinghouse supplied the power centers, motors and controls for the air conditioning system and outdoor lighting for the building approach and plant parking area.

Westinghouse, working with the architect-engineer, general contractor, electrical contractor and Lorillard engineers, had an active part in equipping this plant with the electrical distribution system and with other electrical components required to assure uninterrupted operation and provide for anticipated expansion. Westinghouse can help with

(cont'd)

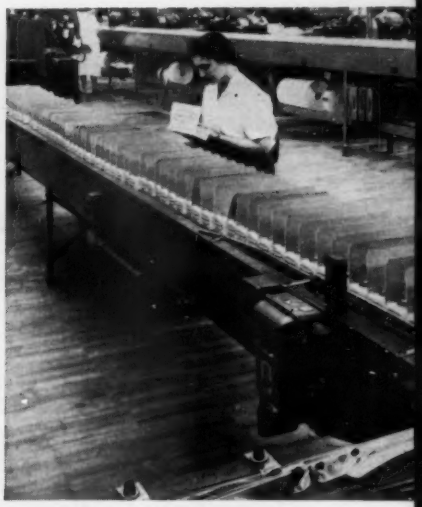
Over 250 pages Westinghouse data in Sweet's Construction File

J-94115-3



This Life-Line class 11-204 motor starter, with fusible disconnects, which activates the Westinghouse 3-hp Life-Line "A" motor to drive a 75-gpm pump, is located in the mechanical equipment room of the ultra-modern plant.

Westinghouse class 11-204 combination magnetic motor starters with fusible disconnects provide remote control and protection for Life-Line "A" motors located throughout the conveyor system. Equipment is designed to move tobacco from hogshead to finished cigarette without being touched by human hands.



Straight-line feeder-conveyor system continues through automatic cigarette-making, packing, cartoning and shipping. Westinghouse automatic controls, pushbuttons and switches "spot control" the conveyor process.

YOU CAN BE SURE...IF IT'S Westinghouse

Specially designed for tomorrow's expansion

any phase of your electrical planning and construction. See your Westinghouse distributor, or write: Westingouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-94115-4

Owner: P. Lorillard Company, New York, N. Y.
Architect-Engineers: Lockwood Greene Engineers, Inc.
General Contractor: H. L. Coble Construction Co.
Electrical Contractor: Starr Electric Co., Inc.
Westinghouse Distributor: Westinghouse Electric Supply Co., Greensboro, N. C.

New complex machinery had to be designed and built by Lorillard to achieve this highly automated plant. J. Berner, Project Engineer, conceived, planned and built much of the special equipment. (Both Berner and R. H. Jobe, Lorillard Draftsman, sport beards in honor of Greensboro's 150th anniversary.)

Wm. Folk, Jr. (right) explains the full line of electrical equipment carried by Westinghouse distributors for immediate delivery. This reduces the inventory Lorillard must carry for replacement needs. Others shown left to right: W. D. Rhea, Power Engineer; M. W. Breitmeier, Plant Maintenance; O. B. Van Hise, Plant Engineer; J. Berner, Project Engineer; all of Lorillard Plant Engineering Section.

YOU CAN BE SURE...IF IT'S

Westinghouse

For more facts circle 560 on Reply Card

Gets 40% savings in coolant costs by change to

Standard's Transparent Coolant

ARGON Oil No. 4

Chicago Saws, Inc., realizes other benefits in switch to this Standard Oil product

Situation: It all started when a Standard Oil lubrication specialist recommended ARGON Oil No. 4, Standard's transparent coolant to Chicago Saws for use in their grinding operations. This manufacturer of rotary saw blades decided to give it a try. They knew the product was the result of more than three years' work in Standard's research laboratory, and that it had been extensively field tested.

What happened: Using ARGON Oil No. 4 in 100:1 concentration, Chicago Saws was able to reduce coolant costs 40%. They also found the work could be seen more clearly when using this coolant. There was less wheel loading. They also discovered the coolant didn't foam and that its exceptional ability to carry off heat resulted in cooler operation. Faster cuts were obtained with finer wheels. Tolerances were easier to hold. Better finishes were obtained. Less frequent wheel dressings were required.

What you can do: Get more information about ARGON Oil No. 4 transparent coolant. Call the Standard Oil lubrication specialist near you in any of the 15 Midwest or Rocky Mountain states. Or write: **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

Using ARGON Oil No. 4, Chicago Saws gets better finish at savings of 40% over other coolants tried. Operator is using .004" cut on heat treated Rockwell 60 C steel.

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Quick facts about

Standard's Transparent Coolant

ARGON Oil No. 4

- Clear, transparent fluid
- All chemical. Does not support bacteria growth
- Unaffected by humidity
- Nonfoaming
- Fire resistant
- Odorless

Standard's Bob Stark and Chicago Saws' vice president Paul Bostrom discuss blades and coolants. Bob Stark is well qualified to work with manufacturers on the use of metalworking coolants. Bob has a chemistry degree from Illinois College plus three years' experience at Standard. He has completed the Standard Oil Sales Engineering School course.

Useless slope converted to valuable parking area with Armco Retaining Wall

A new Expressway in the city of Hartford was constructed below normal ground level. Here is how a useless slope along the depressed right-of-way was converted to a level-land parking lot by installing an Armco Bin-Type Retaining Wall to hold back the fill. You can put this same versatile wall to work for you wherever you need to control earth or protect property.

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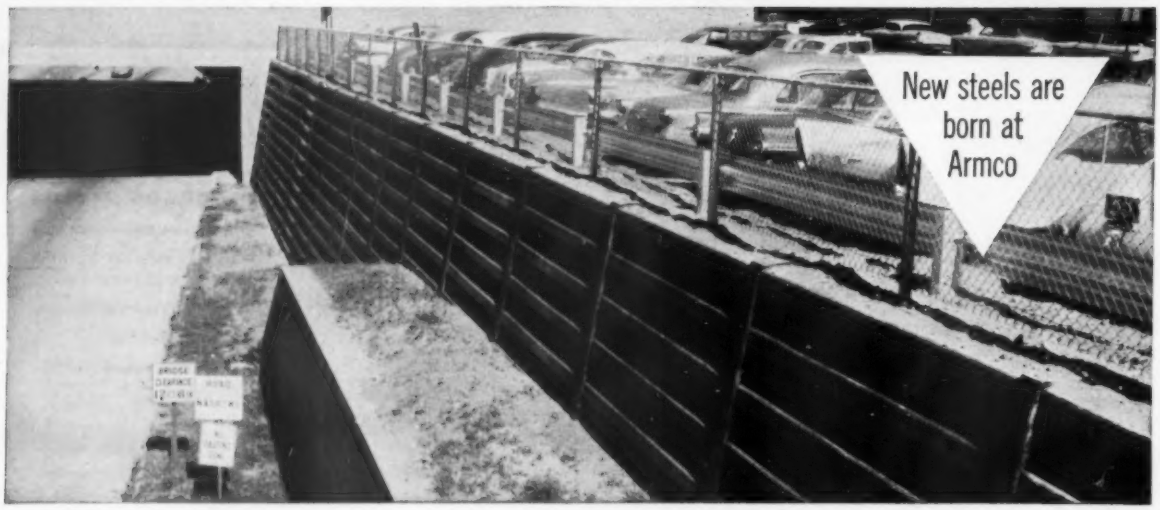
Sturdy transverse sections (sides of bins) are assembled at the site from easy-to-handle units.

Next step is addition of stringer units to enclose face and back of wall.

Interconnected bins are filled with earth or granular material, then backfill is built up to make stable, level area.



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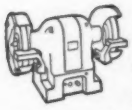

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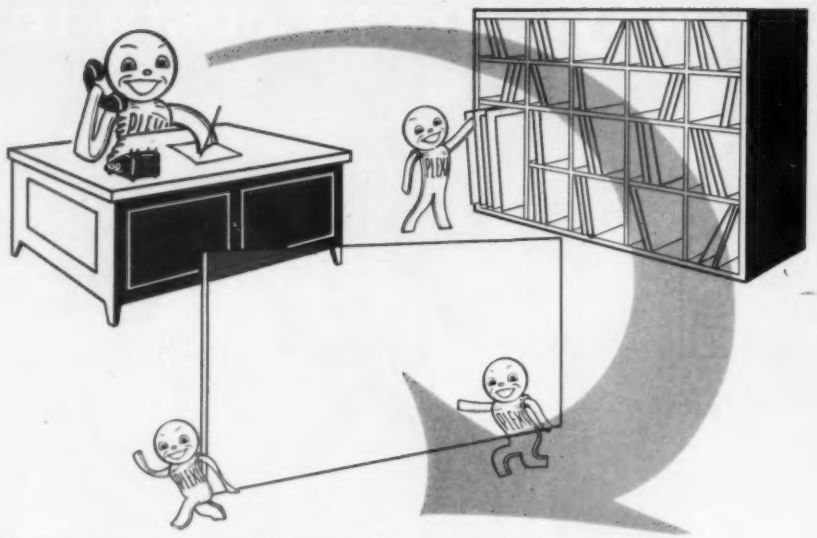

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WHAT'S JUST AHEAD IN THIS ISSUE?

- MODERATE-COST clean room facilities were the goal of Douglas Aircraft plant engineers, and they reached it. How? First of all, by making a vinyl-coated sail-cloth enclosure, which was then slightly pressurized. Turn the page for details about the special air filters, floor sealer, cadmium-plated hand tools and stainless steel bench tops used in the enclosure.

- CUTTING OIL usage can be increased by seeing that it is filtered and sterilized. Western Machine Company is doing just this and is realizing a substantial savings in a number of areas. To find out more about their oil reclamation system, see page 94.

- WHICH METHOD of glare reduction is best for your plant? Glass block? Tinted glass? Shade screens? Venetian blinds? Or, will a combination of several of these correct your glare problems? Western Electric analyzed the various methods to see which would fit their particular conditions. The article on page 98 tells how they are using glare reduction methods in their plants.

- PLANT "HOT SPOTS" are on the cool side now at Sylvania's radio tube plant thanks to air conditioning and specially-designed ductwork. Some of the operations in the plant called for special treatment. To get all the facts about this air conditioning job, turn to page 103.

- REVERSING CONTACTORS are mighty important pieces of electrical gear—particularly when you're trying to operate cranes, hoists, rolling doors and machine tools. In the article, "Troubleshooting Reversing Contactors," you can learn something about the circuitry involved, and how the reversals are achieved. See page 107 for the whole story.

- NEED STANDBY equipment? Not sure on how to go about selling your boss on this need? If you want guidance on this important subject, read the article on page 111, for a practical method of analyzing the cost of such equipment and how to justify it. Analysis charts illustrated in the article will help, too.

- GOOD ORGANIZATION—of men, materials and facilities—is a must, if you want the most efficient operation of your maintenance shops. The author details the workings of his organization in the article starting on page 114, and many of his ideas should be of interest.

Billowing walls of sail cloth are evidence of positive pressure maintained inside this "big top" clean room.

"CLEAN ROOM" IN A BIG TENT

Low Cost Sail-Cloth Walls, Sealed Floors, Do Perfect Job

By WILLIAM S. WATT, Superintendent of Structures, Long Beach Div., Douglas Aircraft Co.

ADVENT OF THE Space Age has left industry faced with a whole new series of tremendous and exotic problems. Many of these problems are concerned with successful missile production, fueling, launching, and control. Some of these problems are in the advanced realms of physics, chemistry, electronics, and the astronautical sciences; others are more down-to-earth and of less headline interest. But solution of the latter are just as important to a missile program.

One of these more mundane but extremely critical problems was dropped squarely in the lap of the Facilities Engineering Department at the Long Beach, California Division of Douglas Aircraft Company, when that company recently contracted to produce liquid oxygen handling equipment for the M-18 Ground Support Program. Components that go into a liquid oxygen system must be more than industrially clean—they must be surgically clean. The slightest amount of organic contamination left on a component at the time it is assembled, or even a slight amount of cleaning solvent trapped in some deep recess of the part, may cause ignition when brought into contact with liquid oxygen.

The problem faced by Douglas plant engineering personnel was to construct a "clean room" in which these components could be assembled, and equip it with production and processing facilities that would assure the degree of cleanliness required. There were no concrete examples of similar clean rooms to guide them. Investigation proved that other companies faced with a similar problem were still pretty much "up in the air" as to

how to accomplish the desired results. The job would have to start from scratch, then be completed by applications of good common sense.

First, the Painting

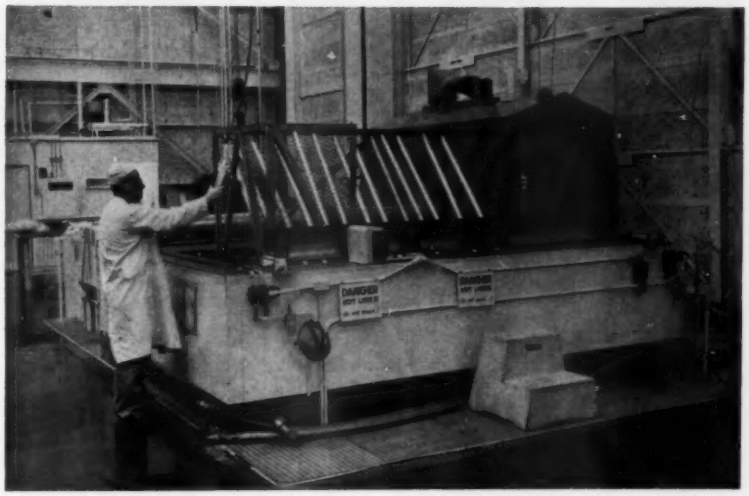
First, an area 100 ft by 130 ft in size was selected in one corner of a large production building. The exterior wall portions were thoroughly cleaned and painted. Solid wood partitions, 10 ft high, were then erected to form the lower portion of the interior wall sections. Interior space between the top of the partitions and the 35 ft high ceiling was then sealed off from the rest of the building with septum cloth (sail cloth), 6 to 8 oz per square yard in weight, vinyl-coated on both sides, and aluminum finished on the inside. The backside (outside) of the cloth was then treated with Albi 99, liquid fireproof spray coating. This cloth came in 36-in. widths, and strips were sewed together to acquire the needed sizes. The coatings on the cloth make both the cloth itself and the joining seam air- and dust-tight. This cloth partition has proved both economical and highly efficient under actual operating conditions.

Positive Pressure

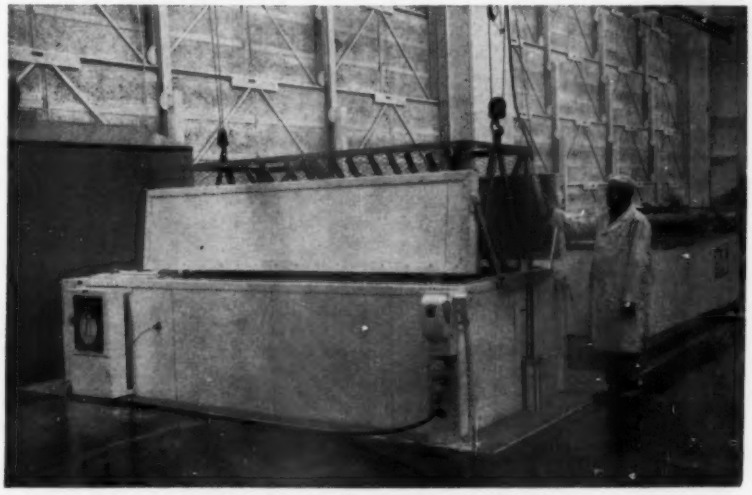
It was decided from the first that the new clean room would have to be pressurized just sufficiently to assure an outflow of air at all times. This would prevent the entrance of dust and other air contaminants when a door was opened, or through any room leaks that might be present. This pressurization was accomplished by selecting one section of the eight section air conditioning system installed in the building, and feeding this section directly into the clean room area. The ducts for the outgoing air were then slightly restricted so that there would be a slight pressure buildup in the room whenever the air conditioning system was in operation (it is kept operating constantly). A flow meter is used to assure that this outflow condition exists at all times, though the outward billow of the septum cloth partitions is an even more noticeable indication.

Special filtering was provided in the input ducts from the air condi-

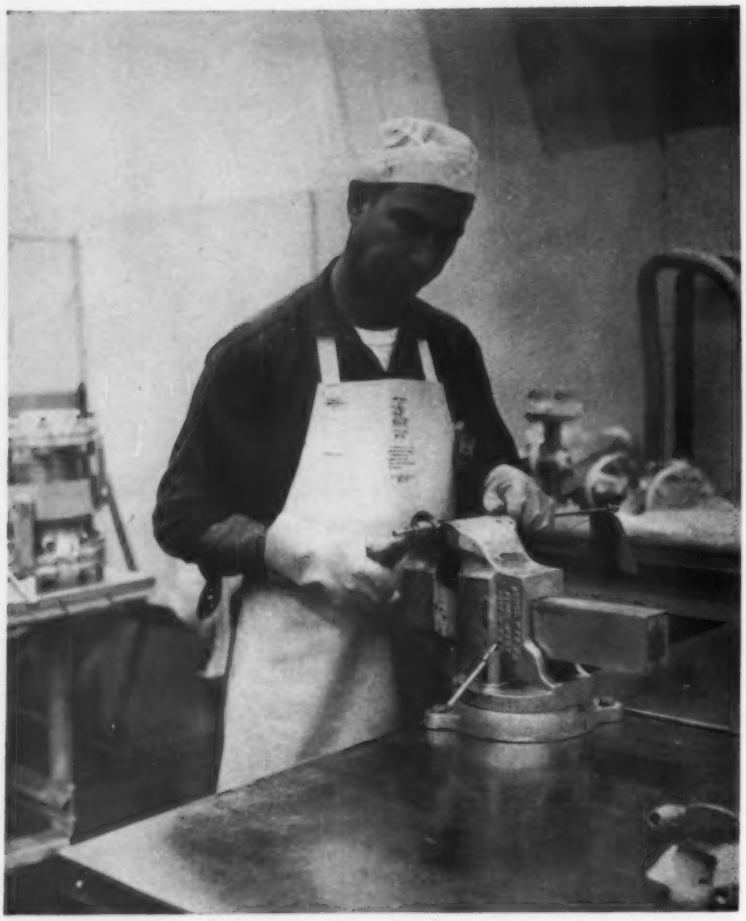
Interior view of clean room. Note polish on floor from three coats of sealant.



Stainless steel basket loaded with parts being lowered into redesigned degreaser.



Same load of components being transferred into drying oven to remove solvents.



Employee works on a part clamped in a cadmium plated vise on stainless bench.

tioning system. This consists of a glass throw-away type filter backed up with a matt strainer. A new matt type strainer is employed for each two throw-away type filters that are installed.

Floor Is Sealed

The cement floor in the clean room was then given three coats of floor sealer (Dipol No. 51). This sealer takes on a mirror finish when polished, and effectively eliminates even the most minute dust traps in the floor. This sealer is reconditioned semi-annually by adding another coat of the same to insure complete sealing.

Construction of the clean room was finished by installing test cells for both low pressure and high pressure testing of the assembled components. Low pressure test cells are of corrugated sheet steel construction with angle iron frames. Tests in these cells are limited to gas pressures of 350 psi maximum. The high pressure test cells, for pressures up to 9000 psi, are of steel reinforced concrete wall construction with a double mesh wire top so that the gas can escape easily in case of accident. The high pressure cells are equipped with dual controls, one set inside, the other outside, to assure added safety.

Proper tooling and processing facilities for the clean room presented another series of problems. Prior tests had shown that conventional degreasing was not sufficient.

In just about three out of ten cases, contact ignition occurred in assemblies wherein the components had been cleaned in a conventional trichlorethylene degreaser. It was suspected that trapped cleaning solvent in deep recesses of the parts was as much to blame for these failures as was any of the various unremoved contaminants.

To overcome this difficulty, the Douglas Facilities Engineering Department came up with a completely redesigned degreaser installation. This new installation consists of a large tank containing two cleaning stages.

First, there is a vapor stage followed by an immersion stage, then a baking oven into which the parts are transferred from the cleaning tank, and where all residual solvent, regardless of its location, is dissipated by the heat.

Steam Heating

The cleaning tank is constructed entirely from 18-8 stainless steel, and is 10 ft square at the top. This provides a 10 ft by 4 ft by 8 ft working zone for the vapor stage, and a 10 ft by 4 ft by 4 ft working zone for the immersion stage. Low pressure (15 psi) steam is used to heat both cleaning stages, thus eliminating the possibility of organic contamination which might result from gas firing.

The vapor stage of the cleaning tank operates at 188 F, the immersion stage at 140 F. The trichlorethylene cleaning solvent circulates through a continuous system composed of a filter, pumps, and 1200-gal storage tank located adjacent to the cleaning tank.

Work is handled into and out of the tank by stainless steel wire baskets. The tank covers are actuated by photocells, and open only while parts are being admitted or removed.

This kind of setup not only minimizes the chances for inadvertent solution contamination through the open top, but also prevents upward to $100 a day worth of solvent losses which, minus the closed top, would be caused by evaporation and vapor escape.

Varying Exhaust

The 10 ft by 4 ft by 8 ft baking oven is located directly alongside the cleaning tank to minimize transfer time. This oven is electrically heated at 250 F. A motorized valve is used to exhaust air from the oven at a varying rate. The exhaust rate is zero when the solvent laden parts are first placed in the oven. But as the parts approach oven heat, the exhaust rate increases. When the parts reach 250 F, oven air is re-

ceiving a full change every three seconds.

All services to both tank and oven are run underground, and are completely sealed against any type of contamination. When the cleaned parts leave the oven, they go directly into a black light inspection booth. This black light is particularly effective in revealing the presence of any contaminant containing a hydrocarbon. When such residual contaminants are found, the area is scrubbed vigorously until completely clean.

All hand tools, bench vises, etc., to be used in the clean room, were cadmium plated. This finish not only makes it easier to clean the tools, but prevents rust also and the subsequent danger of air contamination caused by rust dust. All bench tops, pallet tops, and transportation carts used in the clean room are covered with stainless steel sheeting. Currently, in an effort to keep costs down, a hard anodized aluminum sheeting is being considered for this purpose. The results of this investigation are not yet available.

Clean Room Restricted

Entrance to the clean room area is highly restricted. Each clean room employee has a card key for opening the door, and anyone else entering the room must be accompanied by authorized clean room personnel. The authorized person is then totally responsible for the visitor while in the clean room area.

Everyone entering the clean room must wear a clean white skull cap, white shop jacket, and rubbers. If parts will be handled, white gloves must be worn. All trouser cuffs must be vacuum-cleaned at the time of dressing.

All shop-produced parts receive the usual industrial cleaning before they enter the clean room. In the clean room, they are additionally cleaned in the re-worked degreaser and inspected by black light. All purchased components, unless certified clean and properly bagged, are completely disassembled and the individual parts cleaned. A second fluorescent booth is installed in the assembly area. Here the components and subassemblies are almost continually being inspected as they are put together.

General view of interior shows sparkling finish given to floors by sealer.

A number of air tools are used in the clean room. The air fed to these tools is charcoal-filtered to remove all contaminants and moisture. Thus no contaminants exist in the discharge air from the tool. Cleaning the room is a continuous janitorial chore, with two full-time janitors on the first and second shifts, and one on the third shift. These men do nothing but sweep, mop, and clean at all times. The clean room schedule presented herewith guides their major efforts.

Storage shelves and cabinets in the clean room are kept covered at all times. No part is allowed to remain on an open bench top for more than 12 hr at a time. In case of an operational accident which would result in depressurization of the clean room, the room must be re-certified before assembly operations continue. This involves a dust count in the air, re-cleaning of all exposed parts, and complete janitorial services.

Needless to say, plant engineers in the Douglas Facilities Engineering Department are quite proud of the new clean room facilities and the results obtained to date. They are just as proud of the fact that these very efficient facilities were made available at a very moderate cost. **End.**

Components are sealed in cellophane bags until time comes for final assembly.

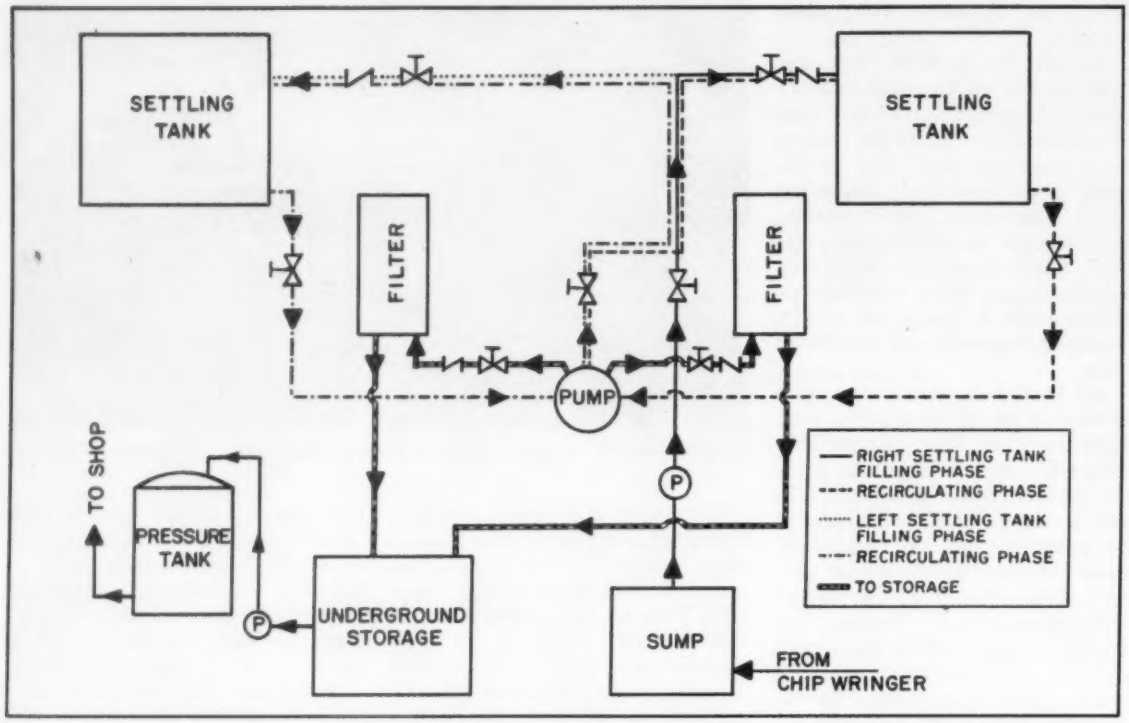


Fig. 1. Schematic diagram showing the relative basic arrangement of various components in the oil reclamation system.

CUTTING OIL GETS "SCRUBBING"

Filtration and Sterilization Pays Dividends

By LAWRENCE A. PATTI, Vice-Pres.—Plant Manager, Western Machine Co., Milwaukee, Wisconsin

THE OPERATION of 50 machine tools including multiple and single spindle automatic screw machines, turret lathes, production lathes, and thread cutting machines produces the tons and tons of steel chips literally loaded with valuable cutting oil. Steel is used for 90 per cent of all production which includes the making of bearing locknuts and parts for outboard motors, farm equipment, earth moving equipment, diesel and gas engines, trucks, locomotives, hydraulic hoists and hydraulic jacks.

After these chips are removed from the machines they are placed in a large 48-in. diameter oil extractor where centrifugal force causes the oil to abandon the chips and flow into a 300-gallon settling tank buried in the floor. When the oil reaches a certain predetermined level in the settling tank a float actuates a pump which pumps the oil into either one of two 500-gallon capacity Houdaille cone bottom sterlizing tanks.

The heating cycle starts as soon as a predetermined level is reached. A temperature of 160 F is maintained continuously for a period of 15 hr. Another pump produces constant circulation during the entire heating cycle. This operation has been responsible for wiping out cases of dermatitis by destroying harmful bacteria

All fine particles drop to the cone bottom section which is cleaned periodically by a quick-opening gate valve. Every six months the entire tank is steam cleaned.

After completion of the heating cycle the oil is pumped through two purifiers. These two purifiers have thermostatically controlled heaters and combination thermometer and pressure gages. The filtering media used is Cranite (processed fuller's earth) and Palconia (cellulose fiber). Ten thousand gallons of cutting oil have been pumped through these two purifiers before it was necessary to replace the filtering media.

Oil flows by means of gravity from the purifiers to either one of two 1000-gallon capacity storage tanks buried underground adjacent to our building. By means of pumps and a series of valves, oil is drawn from either storage tank and forced into a 250-gallon capacity pressurized tank inside the building. See Fig. 4. A main overhead feeder line runs in the shop and branches are piped to each machine. Whenever a machine requires cutting oil the

Fig. 2. One of two filters; sterilization tank is at the right.

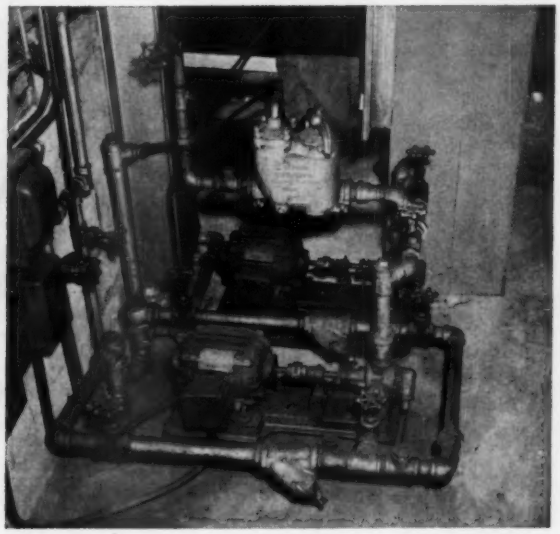


Fig. 3. Two-pump setup used to feed oil to overhead tank.

operator merely pushes a valve and obtains all the oil needed. See Fig. 5.

The pressurized tank is automatically supplied with ample oil at all times. As soon as the pressure drops due to oil being used in several machines simultaneously, a pump is actuated which immediately replenishes the supply from the storage tanks.

The cutting oil is periodically checked by our supplier. Any deficiency found is immediately corrected by making the proper additive and mixing it into the system.

Substantial savings have been effected with this method as noted below:

1. The constant use of clean oil is beneficial to the cutting tools affording better lubrication and cutting action, longer tool life, smoother finish on work and eliminating abrasives which cause tools to become dull resulting in machine downtime.

2. This system permits us to purchase oil in tank car lots and results in a direct savings of approximately 15 per cent.

3. It is not necessary to store large quantities of oil in drums in the plant thus eliminating a real fire hazard. Fire insurance premiums are thereby maintained at a lower rate.

4. The higher morale of the employees who are aware of the clean oil being pumped into their machines is a tangible and extensive asset.

5. Many hours are saved by eliminating the operator's task of obtaining oil from a drum with a 5-gallon container.

6. The overhead and direct distribution of oil to the machines helps in maintaining a cleaner shop and indirectly results in better quality workmanship. **End.**

Fig. 4. The oil in this plant supply tank is under air pressure.

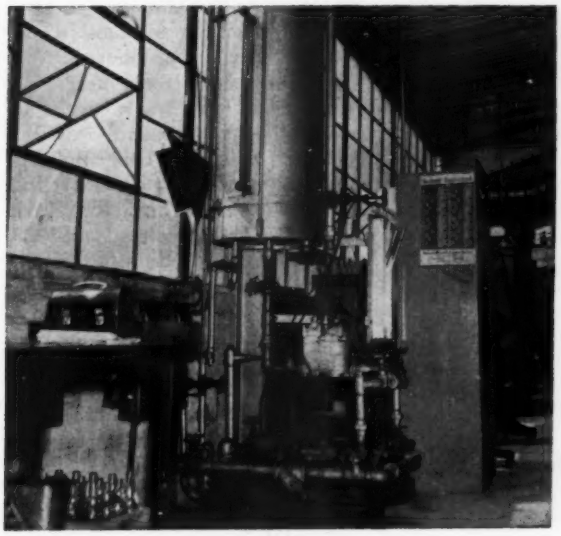


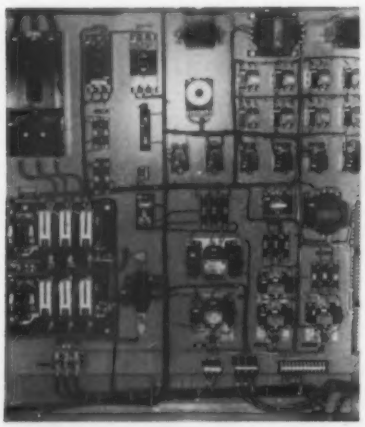
Fig. 5. Pressure on hand disc introduces clean oil to machine.

Are YOUR ELECTRIC CONTROL PANELS REALLY SAFE?

Short Circuits, Downtime, and All Other Hazards Can Be Minimized By Strict Adherence to Good Electrical Standards. It has Paid Off for Western Electric Co.

By M. J. HYLE, R. E. LARRIVEE, A. M. LAWRENCE, Electrical Engineers,
Western Electric Company, Inc., Point Breeze Works, Baltimore, Maryland

EARLY MACHINE design drawings of the Western Electric Company were almost entirely devoted to the mechanical aspects of the machinery. In those days, electrical drawings for manufacturing equipment consisted of vague block diagrams which reflected the less than tolerant attitude of designers toward electrical controls.



Disconnecting device provides short circuit protection up to 100,000 amps. Branch circuit and overload protective devices are provided for each motor.

As automation expanded in the Point Breeze Works, the necessity to provide adequate standards and wiring practices to minimize potential hazards caused by non-uniform wiring practices became quite apparent. As could be expected, some electrical designs were superior to others but without an electrical standard, the distribution of information to each engineer was limited.

In 1954, an investigation was conducted into the effects of a short circuit on control equipment which had both the large main drive motors and small auxiliary motors grouped under one set of short circuit protective devices. The data obtained from this investigation indicated a dangerous condition leading to a possible control panel failure when any overload device was exposed to short circuit currents exceeding 400 per cent of its rating.

As a result of this study, appropriate action was taken to eliminate this problem and the movement toward electrical machine wiring which was safer and more dependable was started.

As could be expected in any engineering organization, unanimous acceptance of the new electrical standards was not immediately obtained. As the years passed, compliance with the 400 per cent rule for machinery purchased from suppliers was more or less spasmodic. The increasing demands for greater production and the accompanying need for the rapid expansion of manufacturing facilities highlighted the necessity for initiating a program to develop a workable set of electrical machinery standards.

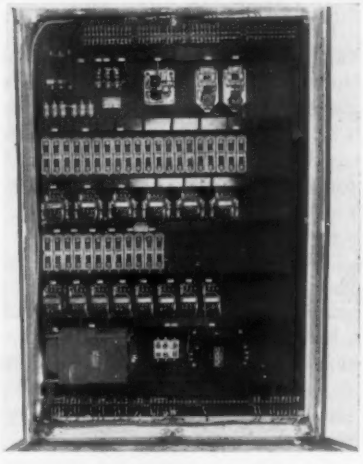
As a result of these needs, an electrical engineer was assigned to review existing standards of the National Machine Tool Builders Association, National Electrical Manufacturers Association, Joint Industry Conference and the National Electrical Code with the purpose of combining the outstanding features of each set of standards to form a workable guide for the purchase or design of electrical controls for machinery. Upon completion of this investigation, a preliminary set of standards was assembled and submitted to engineers in the electrical design organization for analysis and alterations.

Condensed Version of Electrical Standards Sent to Suppliers

1. All electrical equipment shall be designed for an electrical power supply of 440-v, 3-phase, 60 cycles wherever possible.
2. All electrical equipment and wiring shall be in accordance with the National Machine Tool Builder's Association Machine Tool Electrical Standards and this specification.
3. Electrical diagrams and stock lists of electrical parts and equipment shall be furnished by the supplier and approved by Western Electric prior to construction of machinery.
4. A sequence of operations shall be furnished on all complex machinery.
5. Electrical diagrams shall be furnished on a tracing or cloth reproduction.
6. The supplier shall furnish a properly rated disconnecting device such as a NEMA-12 heavy duty industrial type manually operated fused switch or a circuit breaker having a minimum interrupting capacity of 15,000 amp unless otherwise specified.
7. All machinery which has rotating surfaces or cutting edges which would be hazardous to personnel should be wired with no-voltage release magnetic contactors and push-button stations.
8. Motor running overload protection shall be provided for each motor.
9. All motor running overload protective devices shall be protected by fuses or circuit breakers with ratings or settings not over 400 per cent of the full load currents of the motors they protect.
10. For simple a-c control circuits, the control voltage may be 440-v, 60 cycles, and it shall be taken from the load side of the main disconnecting device.
11. For complex a-c control circuits, the control voltage shall be 115-v, 60 cycles. Control transformers shall be normally wound for 440-v primary and 115-v secondary. Additional control transformer capacity of at least 25 per cent more than initial design requirements shall be provided.
12. Several motors may be controlled by one starter if separate running overload devices and protection ahead of these overload devices is provided for each motor.
13. All polyphase motor starters shall not be any smaller than the NEMA size 1.
14. Machine work lights are to be omitted by the supplier except as follows:
    a. Built-in work lights which are an integral part of a machine may be supplied with the machine.
    b. Special purpose work lights of a type that the supplier has developed or has found best for a particular application may be supplied with the machine.
    c. Incandescent lamp holders for work lights shall be of medium base, screw-shell type, shall not contain a switch and shall be rated at 600 watts, 250-v.
15. Accessory outlets if required shall be:
    a. 440-v, 3 phase receptacle—(manufacturer's name, type and catalog number mentioned)—30 amp, 600-v, spring door, 3 wire, 4 pole, housing grounded through shell and extra pole. Plug—(type and catalog number mentioned).
    b. 110-v receptacle — 125-v, 20 amp — (manufacturer's name and catalog number mentioned), Plug—(catalog number mentioned).
16. The standard motor enclosure shall be totally enclosed design. All motors ¼ hp and larger shall be designed for satisfactory operation on 3 phase, 60 cycle, 440-v service, (plus or minus 10 per cent). Motors smaller than ¼ hp may be designed for satisfactory operation on single phase, 60 cycle, 110-v service, (plus or minus 10 per cent).
17. Resistors used in electric heating devices shall be rated for the applied voltage and shall have a safety factor of at least 10 per cent above rated voltage. They shall be capable of dissipating rated power in still air or liquid without exceeding the normal surface temperature of the heating elements.
18. The National Electrical Code shall be observed when specific provisions are not made in specs.
19. The supplier shall be required to submit written assurance of complying with these specifications.

This action resulted in a series of cooperative meetings during which every part of the proposed standard was subjected to critical review and molded into final form. Although the initial task was now complete in the minds of the people in the electrical design organization, circulation of the standard to all other engineering departments at the Point Breeze Works was deemed advisable to obtain their comments. Upon receipt of these comments, the electrical standards were edited, printed and assembled into final form.

Copies of the newly adopted standards were furnished to all local plant and machine design electrical engineers and draftsmen, to product engineering organizations and to the electrical construction and maintenance organizations. In addition, a condensed version of the electrical standard was prepared for use in the procurement of commercial machinery. A copy of this condensed version is sent to each supplier at the time he is invited to bid on machinery and he is required to submit written assurance of compliance with the requirements of the specification in his quotation.



Control transformer, lower right, is designed with 25 per cent extra capacity. Note clear spaces in panel to accommodate additional control components.

The general make-up of the electrical standard consists of 18 major sections covering main controls, control enclosures, wiring practices and power units. Other sections are included covering resistance heating, electrical accessories and prove-in methods. The general scope of each section is in agreement, in part, with the several codes previously mentioned. Attempts were made to incorporate into one standard, the best features of each code based upon our own manufacturing experience.

Safety to personnel was a primary consideration in every case. After safety, all other requirements were reviewed on the basis of maximum economy consistent with superior quality and trouble-free operation. Every effort was exerted to avoid any unnecessary specifications which would not contribute substantially

(Continued on page 242)

Fig. 1. View of shade screens mounted inside building in the cable handling area of our Long Island Distribution House. The screens provide safe working conditions for the lift truck operators who must face the windows while "locking on" to reels.

METHODS OF GLARE REDUCTION
Which One Best Fits Your Needs?

By S. T. DE ROSA, Plant Engineer, Western Electric Co., Inc., New York, N.Y.

SINCE THE beginning of the century, the tendency to enlarge window areas in industrial buildings has been increasing at an astronomical rate. This can especially be noted in the numerous structures springing up in large cities and in the rambling industrial plants of the suburbs in the last 10 years. With this growth of wall openings, however, several problems have resulted, one of which is glare.

Our New York headquarters, the Distribution Planning Engineering Organization, carries the responsibility for a major part of the plant engineering for the company's nation-wide network of distribution centers. Its engineers have been aware of the glare problem for some time and have dealt with it in several different ways. The following is a list of various products or methods which Western Electric has tried or considered in its continuing quest for solutions to the problem of glare reduction.

Glass Block—A decision to use glass block in either interior or exterior walls should be based on whether the higher cost of construction (as compared to standard methods) is compensated for by the benefits derived in a given application.

In order to obtain the optimum general illumination without glare, two types of glass block should be used in combination. The upper block deflects the transmitted light upward to reflect off the ceiling and the lower block transmits light evenly dispersed. The former is usually laid above the eye level (5½ to 6 ft above the floor elevation) so that the light will be directed away from the eyes. The latter type is usually installed below this level.

Figure 2 represents a typical installation that may be adapted, using glass block with an ordinary window. This arrangement will follow the same pattern as described above with the exception of natural light transmission through the lower portion.

Since the functional light diffusing-and-directing-type block did not reduce the glare sufficiently under

certain adverse conditions, a newer type was developed using a fibrous glass or tinted screen. This screen divides the block into two cavities. It is designed to produce greater glare reduction and insulating qualities. Our recently constructed Cleveland Distributing House in Solon, Ohio, used this type block in combination with an ordinary window. Due to its very recent installation, we have not yet experienced a full year's range of solar conditions.

The other merits of glass block installations, which should be investigated in conjunction with glare reduction, are the possible advantages of privacy, decorativeness, insulating value, sound reduction, and lower maintenance costs. The many different patterns that are manufactured are both decorative and functional and can add considerably to the decorative effect of a modern industrial plant.

Maintenance requirements of glass block construction compare very favorably to the painting and other services needed with steel sash and mullion. Window cleaning is also simplified in block construction, since there are no small panes and the entire unit can be cleaned at one time.

Structural strength of the block makes it less susceptible to being broken or marred than the ordinary type window. Since a broken block can still give the building protection against the elements due to its physical qualities, you may put off correcting the damaged unit until a more advantageous time when several blocks can be replaced simultaneously.

Tinted Glass—Our investigation into the problem of glare has resulted in the study of the use of tinted glass on sunny exposures of new buildings. For comparative purposes the cost of this material is somewhat higher than that for ordinary glass. The product usually has a blue-green tint but is also manufactured in various other tints for greater reduction of both light and solar heat transmission as compared with plain glass.

This reduction of light intensity produced by the tinted glass may necessitate a larger wall opening to compensate for loss of light, if natural light is desired. The effect of increasing the window space results in a greater dispersion of the same light without increasing the over-all illumination intensity. This reduction of light concentration, therefore, brings about filtered daylight.

The maintenance costs are similar to that of ordinary glass with the exception that replacement will be proportionately higher.

Tinted Transparent Sheet Overlay—At some of our locations where the personnel have raised objections to too much glare, we have tried a green plastic material applied directly to the individual window. This material was selected after a careful study of the problem and the relative cost involved.

At one location the glare condition was most severe in the warehouse portion of the building where the windows were already installed. Tinted plastic sheets gave excellent results with a minimum amount of maintenance. Paint was evaluated on its merit of low initial costs, but for a number of reasons, especially the periodic maintenance involved, it was discarded.

It should be borne in mind that the light level is reduced at all times whether the potential glare is present or not. The cost of this plastic sheet, including material and installation, averages about 40 cents per square foot.

Venetian Blinds—The use of this product is so widely adopted in all kinds of industrial and residential construction that it requires very little discussion at this time. Its predominate advantage, as compared to other methods of glare control, is the ability to be adjusted at any time to suit the light condition.

Other features are the reduction of the heat load within the building and the decorative value it adds to both the interior and also the exterior appearance of the building. The heat load in computing the air conditioning requirements is reduced by 50 per cent of the actual. The cost of this product may vary somewhat with the material and construction, but for comparison

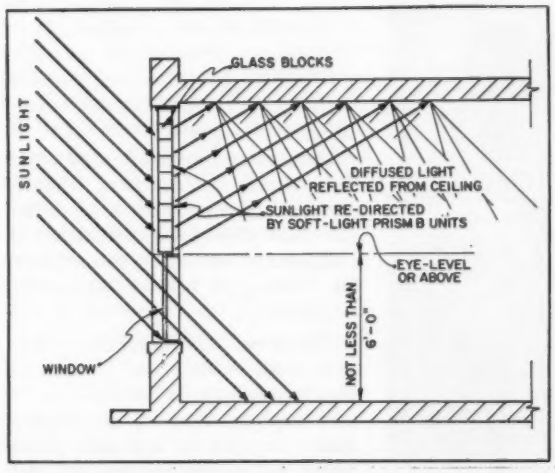


Fig. 2. Typical installation using glass block with an ordinary window. Blocks should be positioned above eye-level.

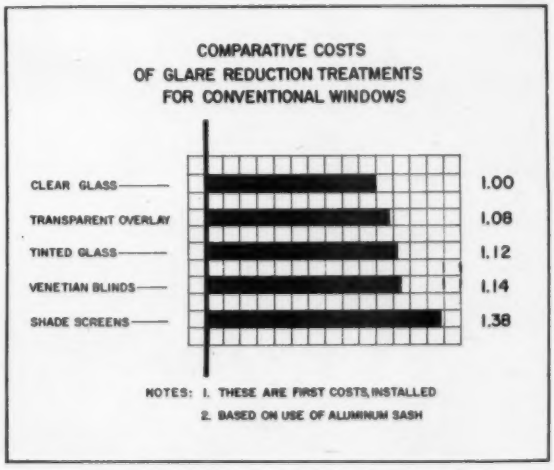


Fig 3. Comparative costs of glare reduction treatments. Chart compares clear glass to four methods of reduction.

purposes an average figure of 65 cents per square foot will suffice.

The maintenance expenditure, which includes periodic dusting, washing, general repair and replacement, has cost Western Electric a minimum of 60 cents per square foot per year. Due to this high maintenance expenditure, we have limited its use mainly to office and shop areas.

Fig. 4. Here, shade screens are placed outside building. Note: screens cannot be adjusted for light conditions—also consider seasonal installation and removal.

Shade Screens—These units resemble closely spaced louvers about 1/16-in. wide, formed as a stamping from either aluminum or bronze. The screen is mounted directly to the exterior of the windows and provides a triple function of reflecting light, heat, and adequate protection against insects. Due to this method of installation, this fixed venetian blind type of screening allows a greater heat reduction within the building than the ordinary type of blinds.

Although this is a desirable quality, the fact that it cannot be adjusted for light conditions and the seasonal problem of removing and installing them, limits their desirability and makes it economically impractical if it were to be used only as a method of glare reduction, without regard to its other benefits.

The cost of this material varies between 25 cents and 40 cents per square foot but when manufactured with the necessary framing for installation, complete cost will vary between $1.50 and $2.00 per square foot, depending on the material required for the frame and screen.

Exterior Overhang—An exterior overhang should be considered as a design feature of newly constructed air conditioned buildings to prevent the direct rays of the sun from entering the establishment. In this respect, a well engineered projection ("eye-brow") does an excellent job of reducing the heat load with a considerable saving in the amount of refrigeration tonnage. Other features of this approach are that it gives maximum light and maximum ventilation with a minimum amount of glare and maintenance problems.

Of significant importance is the fact that these exterior overhangs will distinctly affect the appearance of the building. In most instances, the horizontal straight line construction across the building face enhances the architectural features.

Our experience regarding the problem of glare and its reduction reveals that no definite conclusions can be drawn which could offer general recommendations to all situations. In order to analyze intelligently the requirements in respect to a particular installation, it is necessary to ascertain, first, all the details regarding the problem or problems.

The most important items to be considered in the selection of a material or product are, in the order listed: 1. general requirement; 2. first cost; 3. appearance; 4. ease and cost of maintenance.

General requirements may cover the related problems of natural light, ventilation, and heat reduction that should be considered in conjunction with glare and whether the building is new or an existing structure.

The problem of selection, therefore, resolves itself into a matter of weighing all the characteristics of each type in view of the requirements involved for a definite installation and thereby arriving at a logical selection. **End**

Fig. 5. Because of maintenance expenditure, which includes dusting, washing, repair, replacement, venetian blinds are used only in our office and shop areas.

GALVANIZED STEEL SHEETS— SELECTION, MAINTENANCE

What life span can you expect from your galvanized steel structures? Generally, it's a long and useful one but you can probably extend it if you specify correctly in the first place and then apply these common sense maintenance procedures

GALVANIZING any ferrous surface will protect the base metal both mechanically as a shield from the atmosphere, and electrochemically in a unique "sacrificial" process. As long as the galvanized coating is unbroken, the underlying steel will be sealed off from the corrosive attack of most atmospheres by the mechanical barrier of the zinc layer. To a degree, this kind of protection is afforded by paint. If paint coatings break down and the steel becomes exposed the protection provided by zinc coatings comes into play—through galvanic action *after* the zinc layer is broken.

By virtue of its higher position in the galvanic series with respect to iron and steel, zinc coupled to the ferrous metal in the presence of moisture, becomes anodic. This galvanic mechanism directs attack by the elements to the zinc with the result that the exposed steel remains free of corrosion as long as sufficient zinc remains.

The difference in electropotential between zinc and mild steels is moderate; therefore, while the electrolytic action is strong enough to provide protection to the steel, it is low enough to avoid rapid disintegration of the protective zinc coat.

An important consideration in plant management economics is the service life that can be expected from any building material and the degree of maintenance that will be required for efficient operating conditions.

The accompanying chart—a summary of ASTM reports—shows the extent of maintenance-free service life that can be expected of galvanized steel sheet. Controlled observations were made in a variety of atmospheres: severe industrial, Atlantic Coast marine, rural marine, and rural. Corrosion measurements are reported for sheet covered with 2-½ oz of zinc per square foot of sheet, for 1-¼ oz of zinc per square foot, and for unprotected steel.

How to Specify

There are four important things to consider in selecting galvanized corrugated steel sheet for plant roofing and siding: amount of zinc coating, gage of the material, width of sheets, and advisability of special shapes.

Zinc Coating—Because the amount of zinc coating determines the rust-free life of galvanized sheet, a heavy coat of zinc is most desirable.

In specifying galvanized sheet steel for plant construction, it is best to buy only sheets that are labeled to show the weight of this coating. The weight of zinc coating on galvanized steel sheet is usually stated in ounces per square foot of sheet. A 2-oz coating, for example, means that there is a total of 2 oz of zinc on both sides of a square foot of the flat sheet, or approximately 1 oz on each side.

American Society for Testing Materials has written and adopted two specifications covering the manufacture of galvanized sheet steel; these are A93-58T, "Zinc Coated (Galvanized) Iron or Steel Sheets, Coils and Cut Lengths," which covers sheets carrying all weights of coatings commercially available from "light commercial" to "2-¾ oz" per square foot; and A351-58T, "1.25 oz Class Coating (Pot Yield) Zinc Coated (Galvanized) Iron or Steel Roofing Sheets," which covers a single quality of sheet, the same as 1.25 oz sheet from A93-58T.

While 1.25 oz sheet is widely distributed as standard, many service conditions call for heavier coatings. In 1931, with the approval and acceptance of nearly the entire steel industry, American Zinc Institute developed a "Seal of Quality" specification and trademark which has since been adopted by practically all galvanized steel producers in the United States. This specification covers sheets having 2 oz of zinc coating per square foot more closely controlled than under ASTM Specification No. A 93.

Gage: For roofing and siding, select gages that will be appropriate to the load that must be carried.

How long will galvanized steel sheets last in your area? It will depend on the weight of zinc coating and the corrosiveness of the atmosphere. The table below shows some representative longevity measurements in various types of atmospheres.

OUNCES OF ZINC PER SQUARE FOOT OF SHEET (BOTH SIDES) UNPROTECTED STEEL

Site	2½ Ounces			1¼ Ounces			
	Years for First Rust	Years for 100% Rust	First Perforation Any Sample	Years for First Rust	Years for 100% Rust	First Perforation Any Sample	First Perforation Any Sample
1. Severe Industrial[1]	5.9 Average	14.4 Average	19.5	3.2 Average	6.1 Average	15.5	2.0
2. Severe Industrial[2]	4.6 Average	11.2 Average	17.5	2.4 Average	4.3 Average	13.5	4.3
3. Rural[3]	20.5 Minimum	None After 32 Years	None After 32 Years	14.6 Average	29.0 Minimum	None After 32 Years	24.0
4. Atlantic Coast Marine[2]	13.1 Average	23.0 Minimum	None After 25 Years	6.8 Average	15.2 Average	None After 25 Years	4.9
5. Rural Marine[2]	Spots in 19.8 Minimum	.....	21.5 Minimum	Spots in 10.6	.....	14.8	3.6

[1]Data taken from 1952 Report. [2]Data taken from 1954 Report. [3]Data taken from 1958 Report.

The above table is a summary of reports of ASTM Committee A-5 on Corrosion of Iron and Steel, Subcommittee XIV on Sheet Tests, showing results on galvanized sheets in a number of locations. It indicates what can be expected as typical service lives. The types of atmosphere represented here are: 1. Severe Industrial—Brunot Island, Pittsburgh, Pa. 2. Severe Industrial—Altoona, Pa. 3. Rural—State College, Pa. 4. Atlantic Coast Marine—Sandy Hook, N. J. 5. Rural Marine—Key West, Fla.

Widths of Sheets: Roofing sheets with 1¼ in. corrugations are 26 in. wide; those with 2½ in. corrugations are 27½ in. wide. Either of these covers a net width of 24 in. and allows a side lap of one and a half corrugations, one edge up, the other down. Used as siding, a side lap of sheets with 2½ in. corrugations need only be 26 in. wide to cover a net width of 24 in.

Special Shapes: Laying a roof requires such items as ridge rolls, valleys and hips. It is not practicable to work these from ordinary sheets, and the slight extra cost of these items is more than compensated by the savings in labor and superiority of the shop-fabricated product.

Allowance for Laps: In ordering galvanized corrugated sheet for plant construction, don't neglect to make allowances for laps, since these are necessary for desired protection. This overlapping on the sides and ends increases the number of square feet of formed steel sheets needed to cover an area, and the amount of the increase required varies with the degree of over-lap.

Before specifying galvanized for plant construction, the plant engineering staff should select the correct galvanized sheet for the application at hand, best method of installation, suitable fasteners, etc.

Maintenance of Galvanized

Eventually, of course, weather and wear will reduce the effectiveness of zinc-coated steel to a level that must be checked and reinforced; the slow process of erosion to which all materials are subject plus the slow disintegration that accompanies zinc's "sacrificial" protection will finally remove sufficient quantities of the metal so that repair is necessary.

Simple preparation of the galvanized sheet followed by application of suitable paints in accordance with recommended practice will result in renewed efficiency and good looks.

For best results, galvanized roofing and siding should be painted with zinc dust-zinc oxide paint, which is commercially available and commonly known as MZP.

Metallic zinc paint in untinted form imparts the familiar "battleship gray" to surfaces on which it is applied, and is also available in red, green and buff. Zinc dust and zinc oxide in MZP provide an elastic film that adjusts itself to expansion and contraction changes caused by mechanical and temperature variations.

Paint at First Sign of Rust—Galvanized steel sheet roofing and siding should be painted at first sign of rust. Dark discoloration of the galvanized metal surface will signal that rust is imminent. Maintenance should follow quickly for best results; delaying beyond this point is poor economy.

It is important that all loose rust and scale as well as any accumulations of dirt, industrial deposits or other foreign matter be removed with a stiff fiber brush or broom. In preparing a rusty steel surface for painting with MZP it is usually unnecessary to wirebrush the surface to free it of rust particles; it is sufficient to whisk away the loose particles.

Use Single Coat System—Initially, apply metallic zinc paint in a one-coat, system with repaint coats

(Continued on page 242)

SYLVANIA'S PLANT "HOT SPOTS" GET COOL TREATMENT

Air Conditioning— Plus Planned And Placed Exhaust Hoods Solved the Toughest Problems

Fig. 1. Without air conditioning, working temperatures in some operations would soar over 100 F. This illustration shows one of the "hot spots" where glass must be worked over open flames on this stem machine. Excessive heat and fumes are vented through special air hoods.

WHY INDUSTRIAL air conditioning? Sylvania Electric Products' new highly automated radio tube plant at Altoona, Pa., provides a many-sided answer to the question.

Experience at Sylvania's tube plants in Shawnee, Oklahoma, and Burlington, Iowa, showed post air conditioning productivity increases of 7 per cent and more, with absenteeism and labor turnover rates reduced as much as 50 per cent. Controlled temperature and humidity levels are essential in certain of its tube manufacturing operations, and in addition, air conditioning contributes to plant safety and maintenance.

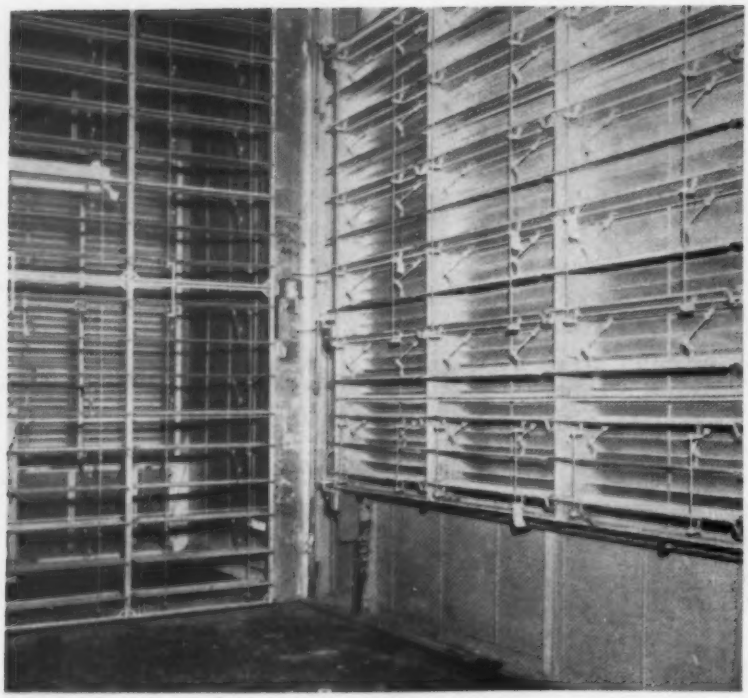
Based on this prior experience, Sylvania considered the installation of air conditioning for its new, 190,000-sq ft plant in Altoona. In full operation since October, the plant produces 2½ million radio receiving tubes per month.

The building is erected against a hillside and has two levels. Main manufacturing area and offices are on the upper level, with storage departments, machinery and boiler rooms, and cafeteria on the lower level. The plant's air conditioning system consists basically of two large chilled-water air washers for the manufacturing area, fan-coil type units for other areas, and two refrigerating machines totalling 900 tons capacity.

Among the reasons for investing in this complete, year-round air conditioning system are:

"Hot Spots". Without air conditioning, working temperatures in some operations would soar over 100 F. All major manufacturing operations of the plant are located within an 80,000 sq ft unobstructed area. Air conditioning, therefore, of those areas involving high temperature treatment of glasses and metals requires supplemental exhausting as follows:

Bulb and Stem Department. Machines within this area



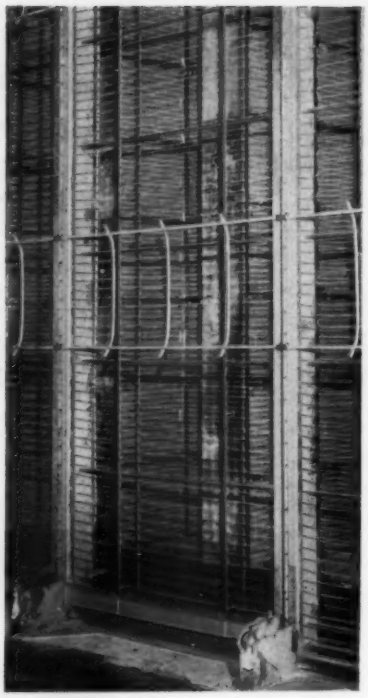


Fig. 2. Left: The two central air conditioning stations for the plant areas are housed in two roof-top penthouses. Outside (primary) air intake vents are on right; plant (secondary) air intake vents are on left. Fig. 3. Right: Roll-type paper filter (not shown) is mounted on rack in foreground, and with filters behind rack, remove dust particles.

fabricate and form the stem or foundation of the tube with molten glass sealed around wire leads. In addition to the contaminating gases discharged in the sealing process, the excessive heat also must be exhausted by specially designed ducts. The glass envelope to enclose the finished tube is formed on other machines generating excessive heat which would reduce the efficiency of that air conditioned area were it not for zone exhausting.

Units Department. Two major functions of this area which generate high temperature are (1) machines which seal the tube envelope to the stem or header and (2) operations which heat and de-gas the metal tube parts by induction principles. These machines require exhausting through specially designed hoods and ducts.

A separate exhaust system also removes heat and gases from furnaces and quenching tanks in the machine shop.

Other problem spots are those where vapors and gases must be removed for both comfort and process reasons. In one series of tests, radio tubes were exposed within 50 ft of stem machines, which use a sulphur dioxide bath as a lubricant in molding glass.

When the humidity level in the area was high, it was found that the majority of the tubes, after exhausting and sealing, could not meet performance specifications. The SO^2 had combined with air moisture to form an acid, destroying or weakening the electron-emitting capacity of the tubes when it came in contact with the emitter coating (calcium, strontium carbonates).

This is only one of many examples of how a clean, controlled atmosphere is essential in Altoona's operations to eliminate product shrinkage and rejects which would otherwise occur.

Humidity Control. A low, uniform humidity eliminates corrosion potential and accompanying maintenance expense. In high-voltage areas, humidity-caused sweating on metal parts can cause hazardous electrical short circuits. Control of air moisture level is one important safety factor in removing the risks of induction burns, for example, from 20,000-volt bombarder units used in tube production.

On the other hand, if humidity were extremely low, a different hazard would exist in the form of static electricity. This is particularly true in respect to Sylvania's use of acetones, petroleum ether and other highly volatile liquids, which require flash-proof containers and spark-free handling equipment. Such liquids are not used in the filament coating room, where humidity must be kept between 25 and 30 per cent.

Product Quality Control. The size of the glass envelope on radio tubes has gradually decreased in size, with the result that even on standard commercial tubes spacing between parts is now often less than 0.0002-in. The working properties of wire (some as small as 0.0001-in. in diameter) and other materials vary with temperature and humidity, so that a controlled, uniform atmosphere is a must in such precision work.

Another advantage of air conditioning is that it reduces perspiration, thus minimizing the chances of tube contamination from salts and perspiration.

In addition to providing heating, cooling, and humidity control, the system filters and cleans the air. In the stations serving the manufacturing area, a series of filters eliminates dust particles and other foreign material down to 2-micron size. Unless these contaminants were removed, they would carbonize under heat and cause defective tubes. For the same reason, employees' clothes must be lint-free, and special coats are required in some areas.

The main production area, 200 by 400 ft, is served by two large identical central station air conditioning units located above it, in two roof-top penthouses. Outside air is drawn into the units through a louvered opening in the

apparatus penthouse. There, it is mixed with the required amount of return air drawn from the production area through ceiling grates (normal summer ratio: 25 per cent outside air, 75 per cent return air).

After passing through a series of filters, the air is cooled and dehumidified during the summer season, or humidified and warmed by reheat coils during the winter season. A combined total of 275,000 cu ft of conditioned air per minute is distributed throughout the manufacturing and maintenance shop areas.

A special exhaust air system is provided for this area to remove excessive heat or fumes from "hot spots", such as stations where glass must be flame-worked. Cafeteria kitchen, lavatories, and the infirmary are also provided with roof-discharge exhaust systems.

The office area is air-conditioned by a Carrier central station Weathermaker unit, with an 18,000 cfm capacity. The ceiling-hung unit has the same basic components (outside and return air intakes, mixing plenum, filters, and chilled water coils for cooling and dehumidifying) as the two large 138,000 cfm central stations.

Since the offices vary in size, in number of occupants, in lighting facilities, and in outside wall exposure, the air distribution network is divided into seven separate zones to permit independent climate control for each area. Zones are equipped with reheat coils for warming air as required. The air-heating capacity is supplemented in winter by separate heating units around the outside wall perimeter to offset transmission losses through office walls and windows.

In all, six such central air handling units are used in the plant: one each for the offices, the cafeteria, and the filament coating room; one for the conference room and employee store; and two serving the basement area in which conveyor tube-aging racks and motor generator sets are located. Capacity of the cafeteria unit is 8000 cfm; conference room unit, 2000 cfm.

Two Carrier centrifugal refrigeration machines—one 600-ton unit with 4160-volt motor, and one 300-ton unit with 440-volt motor—furnish chilled water to the rooftop air handling stations, and the office, conference room, and cafeteria units.

Water in the centrifugal machines' cooler tubes is chilled by transferring its heat to the cold liquid refrigerant. It is then piped to the air handling units where it, in turn, absorbs heat from the air; and, having done its job of air cooling, is returned in a continuous closed cycle.

In absorbing heat from the returning water, the liquid refrigerant boils, changing to a gas. The vapor is compressed by the centrifugal compressor, and discharged into the condenser shell under pressure and at higher temperature than the condenser water in the tubes. It gives up its heat to the condenser water, and returns as a liquid to the cooler again.

Condenser water is supplied from an induced-draft two-cell cooling tower, located on the ground level adjacent to the refrigerant room. Two 250-hp low-pressure boilers are used to heat the water supplied to the system's various preheat and reheat coils during the heating season.

Partitioned off from the main production area, the filament coating room is served by its own separate air conditioning system. The reason for this is that humidity must be kept unusually low (25 to 30 per cent) to insure proper atomization of the spray used in the coating operation.

A small 50-ton Carrier reciprocating unit furnishes chilled water for the department's 3700 cfm fan-coil type unit. The air handling apparatus has dual primary air intakes: one, for taking air from outside of the building for use during the winter heating season; the other, for taking in air from the plant operating area during the normal cooling season. **End**

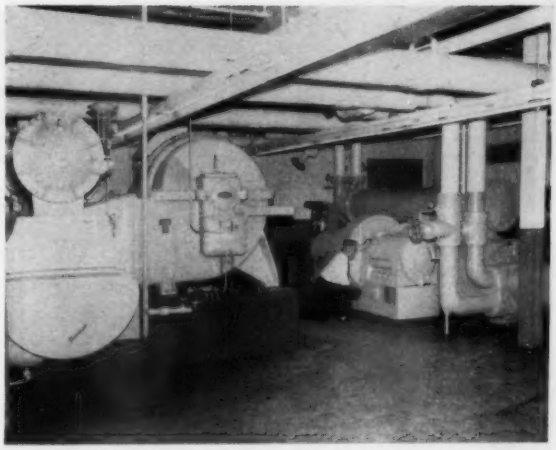


Fig. 4. Chilled water for the plant's air conditioning system is furnished by two Carrier centrifugal refrigeration machines. One is a 600-ton unit and one is a 300-ton unit.

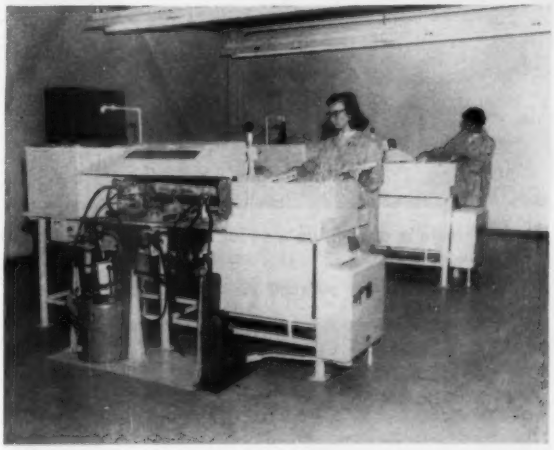


Fig. 5. Filament coating room, above, has separate air conditioning system since humidity has to be between 25 to 30 per cent to insure proper atomization of coating spray.

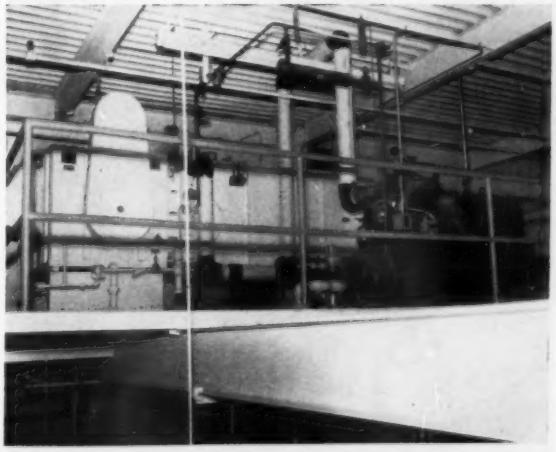


Fig. 6. The compressor-condenser unit, right, furnishes chilled water to fan-coil type air handling unit, shown at left, for filament coating room's air conditioning system.

How To Make A Microfilm File

Fig. 1. Camera is one of two used for microfilming drawings.

Fig. 2. Drawings can be read direct from film in library.

BY MICROFILMING all product and tool drawings, bills of material and specification sheets, Rockwell Manufacturing Co., Pittsburgh, Pa., has insured itself against loss of its accumulated engineering know-how in a catastrophe. However, other advantages alone, of a central microfilm file, have justified the cost of the program.

In addition to the convenience of finding a drawing easily, considerable space has been made available by use of the central microfilm file. Clear-cut photographs of 36,000 drawings ranging in size from 6 in. by 9 in. to 30 in. by 48 in. can be accommodated in slightly more than one cubic foot of storage space, compared with about 500 cu ft required for the same number of original drawings.

Cost of maintaining the central file and servicing requests from divisions are relatively low. The Archives department can photograph bills of material, index sheets and small drawings for $10.00 per thousand, while drawings larger than 14 in. square cost about $30.00 per thousand. It is estimated that these costs are roughly half the cost of having the work done outside the company. Initial cost of each camera was about $1600.

Since the start of the microfilm program, nearly 400,000 sheets, for an average of 2700 per day, have been photographed.

It costs about 28 cents to reproduce an 8½-in. by 11-in. sheet and for larger drawings, about 40 cents per square foot on paper, 75 cents on vellum and $1.50 on cloth.

To start its microfilming program, Rockwell installed two cameras in a truck which visited each of its Research and Development centers and made copies of all drawings on file.

To keep the file up to date, each division sends copies of new and revised drawings to the Archives department which puts them on film.

Archives retains one positive copy and sends the negative to a safe-deposit vault. Archives keeps no index but returns to the division a list of drawings that have been filmed and their location in the files. Each division maintains its own system.

The Archives department has a viewer for reading microfilm directly from the positive. Other viewers in Rockwell's new technical library enable the headquarters engineering department to call for any drawing from a Rockwell division without the expense or time involved in reproduction. Microfilm copies of all company engineering reports will eventually be prepared for library files. All design data will be at a headquarters engineer's fingertips. **End**

TROUBLESHOOTING REVERSING CONTACTORS

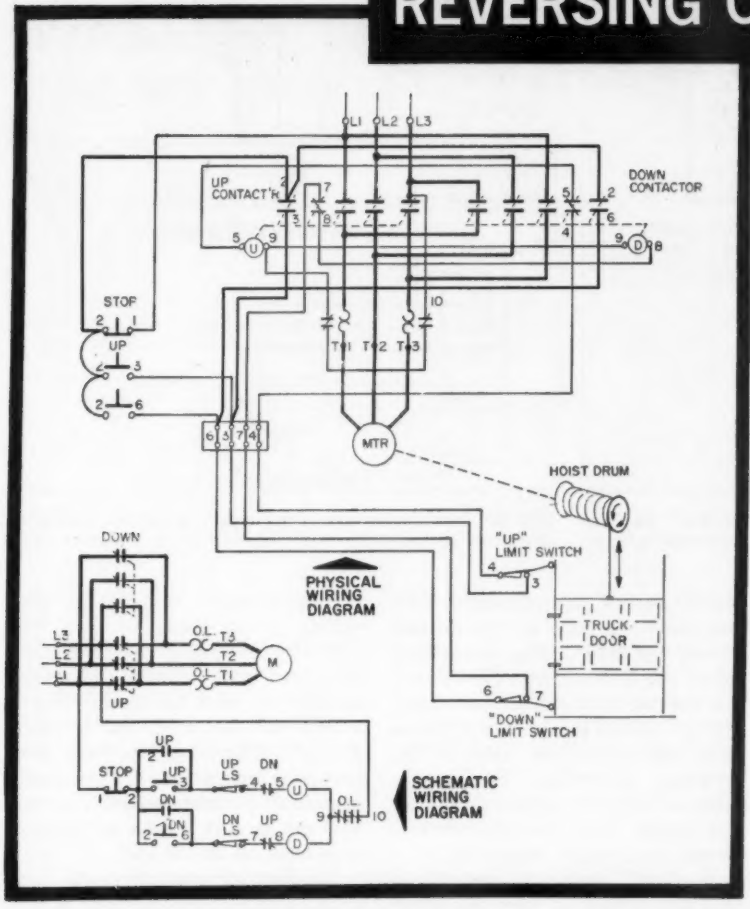


Fig. 1. Reversing contactor and control circuits for typical plant truck door.

Fig. 2. Across-the-line motor contactor arranged for clockwise motor rotation.

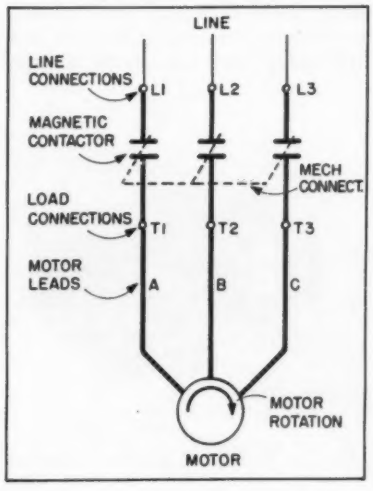
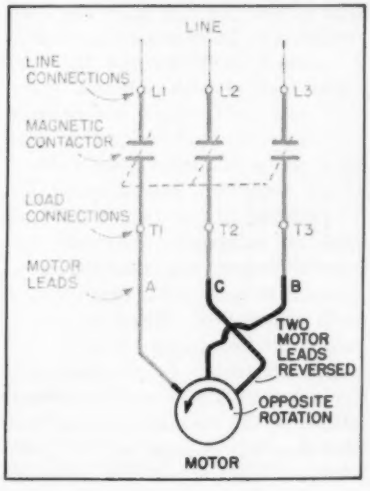


Fig. 3. Reversing two motor leads causes motor to run counter-clockwise.



Part I— How They Work

Understanding how the reversing contactor and its associated control circuits work will be helpful not only in motor applications but also in bi-directional solenoid-operated air and hydraulic control circuits as well. Most machine tools in use today have one or more cylinders used for clamping or transporting parts. Rapid troubleshooting of the control circuits involved is essential to obtain maximum machine productivity.

By VERN KEMPF,
Electrical Editor,
Plant Engineering

REVERSING controllers are widely used in industry to provide a means of running a motor in two directions. Some of the most common applications are machine tools, cranes, conveyors, hoists, elevators, and truck doors, Fig. 1.

Fortunately, reversing a three phase induction motor is readily accomplished by interchanging any two leads. A standard motor starter* is shown in Fig. 2 with connections arranged to produce rotation in a clockwise direction. In Fig. 3, motor leads B and C have been transposed, producing a counter-clockwise rotation of the motor.

If we provide two contactors and wire one of them to produce clockwise rotation and the other

*Troubleshooting standard across-line motor starter circuits was described in the article, "Troubleshooting Industrial Motor Control," that appeared in the August, 1958 issue, page 89.

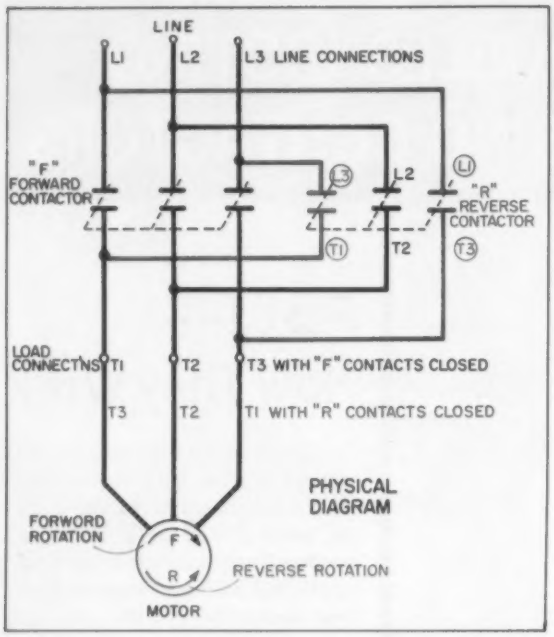


Fig. 4. Three-pole contactors are connected so that one produces forward rotation and the other reverse rotation.

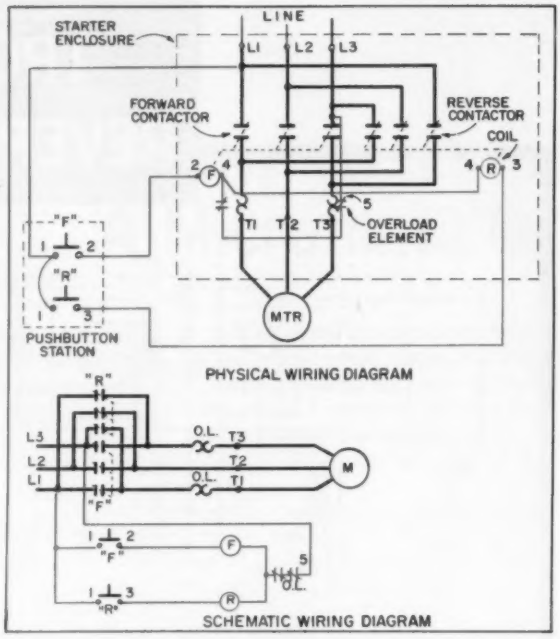


Fig. 6. Each pushbutton is wired to control one contactor. Overload contacts are in series with both contactor coils.

to produce counter-clockwise rotation, all we need to do is energize one contactor or the other to produce the desired rotation. Typical connections in a reversing motor controller are shown in Fig. 4. Note that load connections T1 and T3 are interchanged when switching from the forward or F contactor to the reverse or R contactor. Typical reversing starters, Fig. 5, have all internal wiring completed so that they can be connected directly to line and load wires.

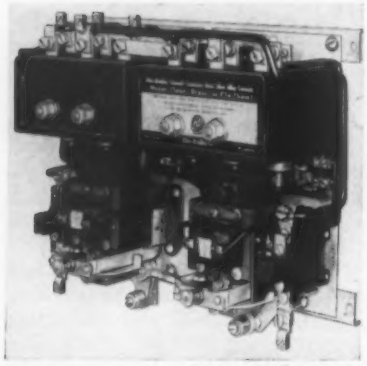
With two separate motor starters to control, we naturally have two solenoid coils in the circuit. These are wired, Fig. 6, so that when the F pushbutton is operated, the forward contactor closes, and the motor produces a rotation that will move the load in the forward direction. Frequently, after all the wiring is completed, the motor leads are reversed to obtain the proper operation.

Overload elements are placed into the circuit so they are effective when either contactor is energized. The normally closed overload control contacts, Fig. 6, are wired in series with each other so that either one can open the control circuit. They are connected to a common wire joining the forward and reverse solenoid coils.

If both the forward and reverse contactors were closed at the same time, we would have a solid short-circuit between lines L1 and L3. To prevent this, two pivoted levers and an adjustable bar are arranged below the contactors to prevent simultaneous operation of both contactors. When one contactor is energized, Fig. 7, the other contactor is mechanically locked open. There are many variations of the mechanical interlock but they all operate on the principle of locking out the opposite contactor when one of the contactors is energized.

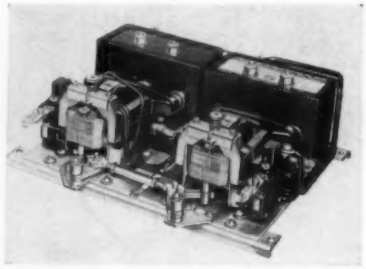
Most reversing starters are equipped with a normally closed contact, on each contactor, that is wired into the circuit as shown in Fig. 8. When the forward contactor is energized, the normally closed F contact, wired into the reverse circuit, opens to prevent operation of the R coil.

Mechanical operation of both contactors at the same time is prevented by the mechanical interlock. This does not prevent electrical operation of both coils at the same time if the operator holds down both buttons. Under these conditions, one coil will close and the other coil will draw a high



Courtesy: Allen-Bradley Co.

Fig. 5. Typical reversing starter comes with all internal wiring completed.



Courtesy: Allen-Bradley Co.

Fig. 7. Mechanical interlock prevents closing both contactors at same time.

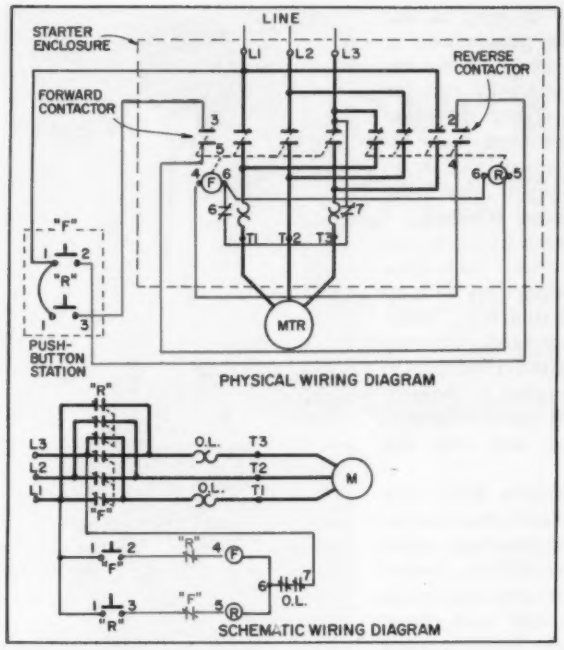


Fig. 8. Electrical interlock provided by wiring normally closed contact of opposite contactor in series with control.

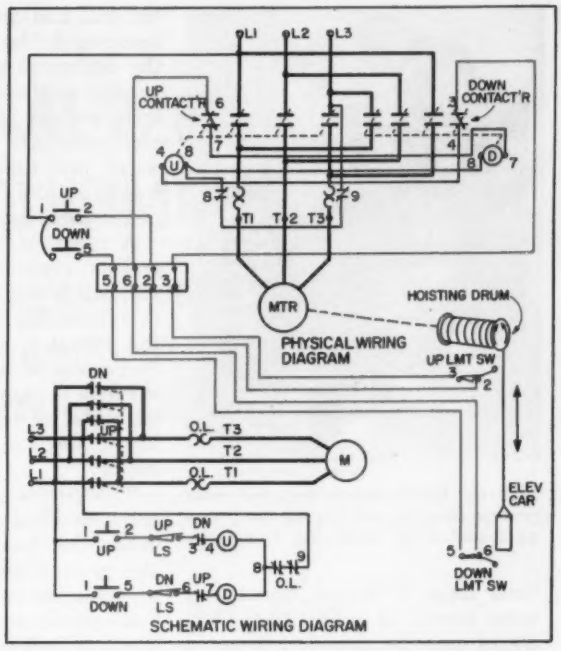


Fig. 10. Normally closed limit switch contacts are wired in series with coil to prevent operation beyond limit point.

inrush current that can cause failure in a short time. The electrical interlock prevents this abuse as it permits a voltage to be impressed on one coil or the other but not on both coils at the same time.

Another method of obtaining electrical interlock is shown in Fig. 9. In this circuit, each pushbutton has a normally closed and a normally open contact. These are wired so that a normally open contact closes to energize the desired circuit and a normally closed contact opens the opposite circuit. This arrangement can be used where the normally closed interlock contacts in the starter are not available or being used to control other circuits.

Many reversing motor applica-

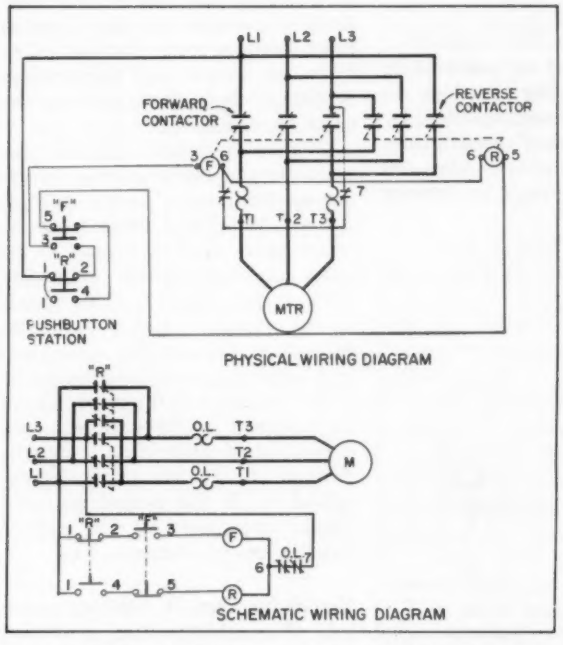


Fig. 9. Electrical interlock can also be accomplished by wiring normally open and closed contacts of pushbutton station.

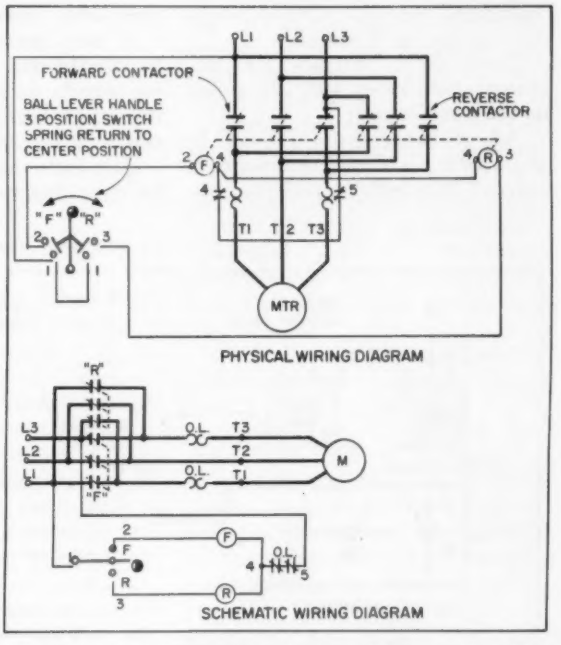


Fig. 11. Reversing control circuit using neutral-position ball-lever switch of type shown in Fig. 14 for operation.

Courtesy: Allen-Bradley Co.

Fig. 12. Drum switch reverses small motors directly and can be used as a pilot switch for reversing contactors.

tions have a limited travel and some means of preventing overtravel must be provided to avoid damage to the equipment. This is generally accomplished by wiring limit switches into the control circuit.

Limit switches are mounted so that some part of the moving equipment operates them near the end of travel. A normally closed contact in the limit switch is wired into the circuit as shown in Fig. 10. When the equipment reaches the "up" limit switch, the circuit opens and prevents further operation in the up direction.

Down limit switches are frequently employed and are wired in the same manner.

All of the circuits previously described have used momentary contact pushbuttons and the motor will run only as long as the operator holds the pushbutton in the depressed position. Some reversing applications may run for long periods in either direction and interlock contacts can be wired into the circuit, Fig. 1, to maintain the circuit after the pushbutton has been released.

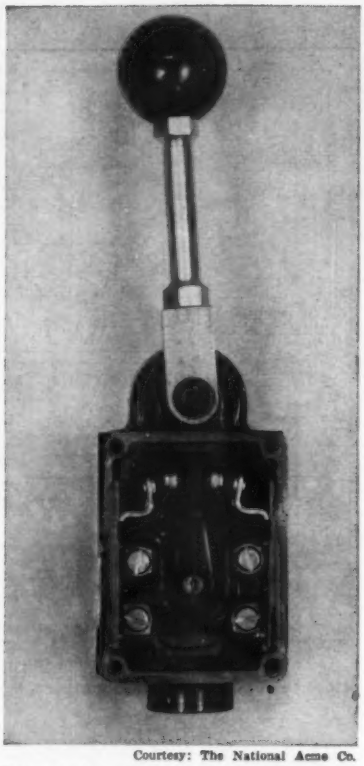
A separate, normally open, interlock contact from each contactor is wired in parallel with its corresponding pushbutton. When the circuit is energized, the contact closes to maintain voltage to the coil. A stop button is connected ahead of both pushbuttons to break the circuit and stop the motor.

Truck door controls frequently use a modified form of this circuit. When the door is raising to clear the opening, there is little danger and the operator can push the "up" pushbutton and walk away. The interlock contact will hold the circuit energized until the door operates the "up" limit switch.

When lowering the door, there is a possibility of a truck attempting to enter the area as the door is closing. To guard against damage to the door when this happens, the interlock contact from the "down" pushbutton circuit is omitted. The operator must stay at the door and hold this pushbutton depressed until the door is completely closed.

A "stop" pushbutton is provided to stop the door at any point in its up travel. Stopping the door on its down travel is accomplished by releasing the "down" pushbutton.

Pushbuttons are commonly used for operating reversing contactors except in cases requiring frequent operation of several different controllers. In these applications the pilot-circuit drum-switch and ball-handle, neutral-position switch have become very popular. Circuits are simple and prevent operation of both contactors at the same time, Fig. 11.



Courtesy: The National Acme Co.

Fig. 14. Neutral-position switch, cover removed, for pilot control of reversing contactors used as shown in Fig. 13.

Typical switches suitable for pilot operation of magnetic reversing contactors are shown in Figs. 12 and 14. These devices can be mounted so that they operate in the same direction as the controlled motion. See Fig. 13. This speeds up the operator's ability to handle several motions at the same time and helps to prevent mistakes.

Moving parts of the machine can be powered by reversible screw drives using electric or hydraulic motors, or by air or hydraulic cylinders. If the proper solenoid valves are used, all the control handles can be identical. **End**

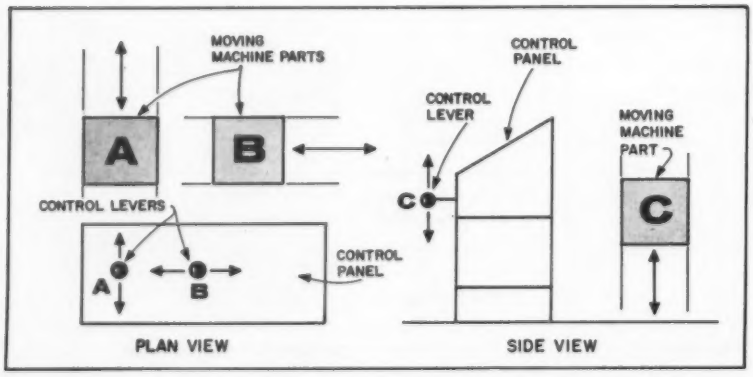


Fig. 13. Ball-handle lever switches can be oriented on control panel to move in same direction as motion of part controlled, thus reducing operator error.

Watch for Part II covering methods of troubleshooting reversing circuits with step-by-step diagrams.

HOW YOU CAN ANALYZE STANDBY EQUIPMENT NEEDS

1. Do You, or Don't You, Really Need Standbys?
2. If You Do, Can You Justify Their Cost?
3. These Analysis Charts Will Give the Answers

YOU, THE PLANT ENGINEER, have probably dreamed about your "ideal" plant, where every vital piece of equipment has a standby unit beside it, ready to take over in case of failure. You have probably envisioned white coated maintenance men deftly twisting valves or throwing switches, putting the standby equipment into service.

Or maybe the opposite is true. Perhaps you have awakened in the middle of the night in a cold sweat, with vivid memories of a nightmare in which your one and only boiler feed pump has cracked a piston. Seriously, all plant engineers would like as many pieces of standby equipment as they can get. Standby equipment saves them work, grief, and often prevents costly production shutdowns.

How, then, do you get this standby equipment? Do you go into your boss's office and say, "Joe, we should get a standby regulator for the main gas line. It'll really save us money in the long run." What do you say to him when he says, "How?", or "Prove it"? Unless you have made a careful analysis of all costs, you are not prepared to answer these questions. A practical guide to analyzing costs with and without standby equipment has two purposes: First, to give the plant engineer a method of determining whether or not standby equipment is justified monetarily, and second, to give him much-needed support in his attempts to justify necessary standby equipment.

This article presents one method of analyzing your requirements, and it may help you to justify the standby equipment you need. The two basic charts will, when completely filled out, form the basis for the analysis.

In any analysis of a problem with many factors involved, certain basic assumptions must be made. Throughout this article, these assumptions will appear, and the reader should be prepared to modify or reverse any assumptions to fit his particular problem. However, the basic format of this analysis will not change with modified assumptions. The first assumption to be made is that all repair parts required for normal repairs of the equipment under discussion are kept on hand, or are readily available from a nearby source.

Analysis Procedure

First step in the analysis of the problem is to determine whether the standby equipment should be installed, ready for use, or kept "on-the-shelf". By analyzing the following factors, this decision can be made.

1. How critical is a shutdown in terms of cost?

2. How long would it take to install the "off-the-shelf" standby as opposed to switching over to the installed standby equipment?

3. Is there available space for installation of standby equipment?

4. What is the initial cost, in terms of time and materials, of installing the standby, as opposed to replacing the equipment when failure occurs with an "off-the-shelf" standby unit?

5. Is there sufficient inexpensive space available for stocking the "on-the-shelf" standby equipment?

Once this analysis has been made, you are ready to study the next step —the probability and frequency of failures.

Sources of Data

With calculations of probability and frequency of failures, relative accuracy can be achieved only by gathering information from many sources. For costly standby equipment, a careful investigation should be made, and all sources of information explored. Let us look into some sources.

First, there is the manufacturer, who can supply much information on probable failures and their frequency. However, manufacturers tend to optimistically minimize failures of their own equipment, so some adjustment must be exercised in use of this data.

Second, and at the opposite end of the spectrum, the sales representative of competitive equipment is a good source of pessimistic information on failures of the competitive equipment you are considering. Somewhere between the statements from these two sources lies the most reliable data.

Third, experiences of your maintenance personnel with similar equipment is another good source of failure information. In addition, you may obtain from the manufacturer or distributor the names of other companies using this equipment. A call or letter to the plant engineers of these companies often brings reliable information.

Failure Analysis Chart

Once you have gathered all the

A Failure Analysis chart such as this will give you the basis for filling out the Standby Analysis Sheet on the next page.

FAILURE ANALYSIS

Equipment: Steam Temperature Regulator
Ace Mfg. Co. — Model 66-R
Date: Jan 12, 1959

PRODUCTION EFFECT: $6.00 Dollars Per Hour; 6 Workers Affected; 1 Hrs. After Failure Before Effect on Production

TOTAL COST PER FAILURE (Labor $3.00 Per Hour)

Failure (Col. 1)	Frequency in Months (Col. 2)	M/H Repair Each Time (Col. 3)	No. of Failures in Period* (Col. 4)	Total Time Over Period* (Col. 5)	Labor $ (Col. 6)	Mat'ls. $ (Col. 7)	Total $ (Col. 8)	TOTAL COST OVER PERIOD* (Col. 4 x 8) $ (Col. 9)	Hours (Col. 10)	Man-hours (Col. 11)	Dollars $ (Col. 12)
1 Line Failure	96	3	1	3	15.00	3.00	18.00	18.00	2	12	72.00
2 Diaphragm Failure	9	2	10	20	10.00	4.00	14.00	140.00	10	60	360.00
3 Packing Gland Failure	24	2	4	8	10.00	1.00	11.00	44.00	4	24	144.00
4 Sensing Element Failure	36	1	3	3	5.00	5.00	10.00	30.00	—	—	—
5 Gasket Failure	18	2	5	10	10.00	2.00	12.00	60.00	5	30	180.00
6 Failure Due to Impurities	3	3	32	96	15.00	—	15.00	480.00	64	384	2304.00
7											
8											
9											
10											
11 P.M.-Overhaul and Servicing	24	4	4	16	20.00	16.00	36.00	144.00	12	72	432.00
*Period is lowest failure frequency. 96 months (from Col. 2)							TOTAL $	916.00		TOTAL $	3492.00

"failure" information possible, this information should be tabulated on a "Failure Analysis" sheet such as the one shown here. At the bottom, on the last line, enter the expected preventive maintenance and overhaul and servicing, if required, for the type of equipment under analysis.

From the information you have gathered, you should complete the frequency column; frequency in this case being defined as the number of months between "like" failures; those failures of like parts or those caused by like external conditions. The failure with the lowest frequency, that is with the greatest time span before repetition of this failure, governs the "Period of Analysis". In the example shown, the "Period of Analysis" is 96 months. Theoretically, this period, or cycle, will repeat itself, thus only one period is used for analysis.

Reading across the Failure Analysis chart, column 3 should be completed by calculating the man-hours required for repair of each failure. These man-hours should include downtime, or time that the equipment would be out of service, as well as necessary time for processing the repair order, gathering parts, materials and tools, and traveling to the area.

Column 4, the number of expected failures in the period of analysis, is obtained by dividing each figure in the frequency column (col 2) into 96, and rounding it off to the nearest whole number. This gives the number of times we can expect each particular failure to occur during the period of analysis.

Column 5 is the product of column 3 times column 4, and is self-explanatory. The dollar costs of column 6, 7 and 8 are next calculated, based on known maintenance labor costs and estimated material costs. Column 9 is a total cost over the entire period of analysis, and is obtained by multiplying column 4 by column 8.

Effect on production of a shutdown of any equipment is one of the most difficult values to analyze. Most production departments have cost figures available for analysis of downtime costs, but first a careful study must be made of the effects, both immediate and continuing, of a failure of the particular equipment under study.

This study must be made with the close cooperation of the production manager of the affected area. His estimate of the cost, to his department, of the equipment failure should be used, unless the figure is obviously in need of modification.

One of the primary reasons for accurate and reliable information in this area is that usually most of your justification will depend upon this figure, and thus it is the first figure questioned. It is usually better to be able to name the production manager in the affected area as the source of information of costs in this area.

Production downtime costs, or "loss of productivity" costs, sometimes prove to be so nebulous a factor that accurate estimating seems impossible. In these cases, a direct

calculation of the number of employees idled during each hour of downtime can be used. Care should be taken not to show production loss for preventive maintenance, as it is assumed that this will be done at a time that will not interfere with production, unless your production is continuous, twenty-four hours a day, seven days a week.

Standby Analysis Sheet

After completing the Failure Analysis chart, the information gained is used in the preparation of the Standby Analysis sheet. Most of the spaces on this form are self-explanatory. Tax and insurance information may be obtained from the appropriate departments in your company.

"Loss of investment interest" represents monies which would have been earned had the equipment not been purchased. However, the failure cost as shown opposite line g on the sheet warrants some explanation. This is the cost, over the period of analysis, of repair and maintenance to both pieces of equipment —the regular and the standby.

Theoretically, when two pieces of equipment are each used 50 per cent of the time, and it is assumed that this is the most economical usage, the cost of repairs for a given period of time should be one-half the cost of repairs to one piece operated continuously. But, this is only true for failures caused by wear, erosion, or other cause directly attributable to use.

In most equipment, deterioration of some parts goes on whether the equipment is used or not, and this factor must be taken into account. Also, equipment that has been idle often develops trouble. Such factors as dirt accumulation, settlement of foreign matter, corrosion due to atmospheric changes, and other conditions can cause trouble to unused equipment.

After extensive study, one engineer has determined that the cost of preventive maintenance and repairs to two units of equipment, each used only 50 per cent of the time, will average about 70 per cent of the cost of repairs for one unit running continuously.

This figure will vary in individual cases, and some thought should be given to adjusting it, considering the type of equipment and the probable effect of age deterioration and other non-wear factors on the equipment. Lacking any unusual factors, though, the 70 per cent figure will be sufficiently accurate.

Some other assumptions must be mentioned at this time. For example, it has been assumed that the failures always occur during production times. As most equipment is subjected to its hardest use during these periods, this assumption is usually valid. Few plant engineers can remember a time when a piece of vital equipment failed during off-shift hours. Also, the cost of stocking standby equipment has not been taken into consideration, and in certain cases this cost might be considered, depending upon the size of the equipment and the availability of storage space.

The example shown in the illustrations, the steam temperature regulator, is not intended to be an actual case. To avoid any confusion, it should be pointed out that the failures listed, the times and costs shown, are intended only to illustrate the use of the charts, and are not intended as a guide to actual failures in steam temperature regulators.

Once the Standby Analyis sheet has been completed, you can now determine not only whether standby equipment is justified but, if so, how much savings will be realized. Fortified with the Failure Analysis chart and the Standby Analysis sheet, you, the plant engineer, can confidently predict the necessity of the standby equipment.

Savings as shown represent only one period of time—in the example 8 years—and these savings continue indefinitely. **End**

Standby Analysis Sheet, where figures from the opposite page are put to work.

STANDBY ANALYSIS

Date: Jan. 12, '59

Equipment: Steam Temperature Regulator
Ace Mfg Co. Model 66R

Function of Equipment: To regulate temperature in two degreasing tanks that are used to clean sheet metal.

Period of Analysis 96 Months (See Failure Analysis Sheet)

a -	Cost of Standby Equipment (Delivered, Including Taxes)	$ 952.00
b -	Installation Cost (Labor, Parts, Materials)	288.00
c -	TOTAL INSTALLATION COST	$ 1240.00
d -	Taxes Over 96 Months	$ 192.00
e -	Insurance Costs Over 96 Months	$ 28.00
f -	Loss of Investment Interest at 7 % of Installation Cost (Calculated Over 8 Years)	$ 694.00
g -	Failure Cost -- 70% of Total of Col. 9 on Failure Analysis	$ 641.00
h -	TOTAL (c, d, e, f, g)	$ 2795.00

RECAP

i -	Total Cost Over 96 Months Without Standby Equipment (Total of Col. 12 on Failure Analysis Sheet)	$ 4408.00
j -	Total Cost Over 96 Months With Standby Equipment (Col. g above)	$ 2795.00
k -	(Savings)(Increased Cost) With Standby Equipment (Strike Out Applicable One) (Col. i-j above)	$ 1613.00

Originator W. W. Smith
Title Estimator, Maintenance

OPERATING MAINTENANCE SHOPS
Organization, Training and Records Are Essential

By OTTO J. SEIDL, Plant Engineer, Combustion Engineering, Inc., East Chicago, Indiana

OPERATING a maintenance shop in an industrial plant is a challenge, at best. While our shop procedures do not contain any "miracle ingredients" we find them successful enough to warrant this presentation.

Our East Chicago properties comprise approximately 36 acres of land in one area, and a short distance away, we have another 10 acres of property.

Our manufacturing operations can be divided into two main categories; tubular work, metal machining and fabrication. The bending of tubing is done on machines of our own design as well as on some standard bending machines. The welding operations are performed by both hand and automatic equipment.

Included in our physical equipment are 17 overhead cranes ranging from 5 to 20 tons in capacity, lathes ranging in size up to a Gisholt Model 5-L, horizontal boring bars ranging up to 6 in. in size, vertical turret lathes and vertical boring mills ranging up to 16 ft in diameter. In addition to a power plant for providing heat and the necessary process steam for pickling operations, we have the usual complementary equipment such as air compressors, acetylene generating equipment, an oxygen cascade system, and a deep well with 500-gpm capacity.

With this picture in mind, consider the formal organization chart, Fig. 1. As shown on the chart, the department is divided into two main groups—the engineering group and the maintenance group. We are primarily concerned with the maintenance function, in this article.

The maintenance group is headed by a maintenance foreman. He has reporting to him a millwright foreman, an electrical foreman, a building maintenance and pipefitter foreman, two clerks and a storeroom attendant.

The millwright foreman supervises a total of 23 craftsmen in the following categories: 3 machine builders and repairmen, 10 class A millwrights, 4 class B millwrights, 1 crane mechanic, 2 machine lubricators, 2 automotive or mobile equipment mechanics, and 1 automotive or mobile equipment lubricator.

Machine builders and repairmen carry the highest classification, since they perform the more complex machine construction work and the most difficult machine repair. They are in our 21st labor grade. Our class A and class B millwrights perform the more routine tasks of repair. The class A millwrights are in the 17th labor grade and the class B millwrights are in the 13th. The crane mechanic is a class A millwright specializing in crane maintenance and lubrication, and as such, gets the A rate of pay. The two machine tool lubricators lubricate all of the machine tools in the plant and are in the 17th labor grade. The two automotive mechanics maintain all of the mobile equipment. These mechanics are in the 20th labor grade. The automotive lubricator is in the 12th labor grade.

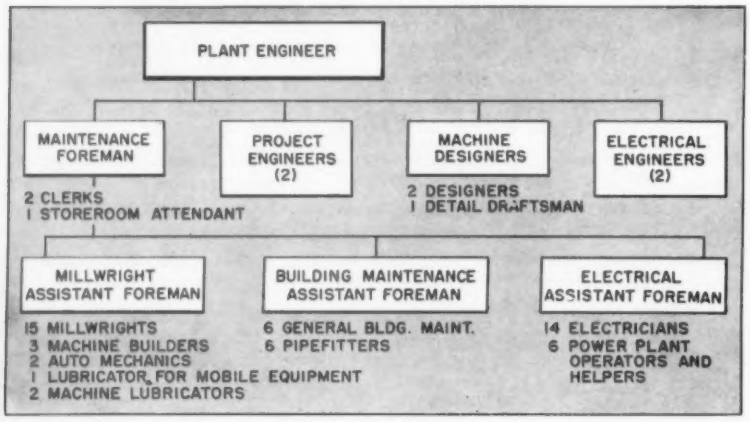
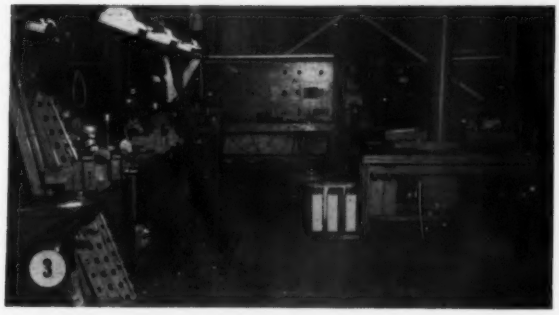


Fig. 1. Organization of Plant Engineering department shows crafts, personnel.

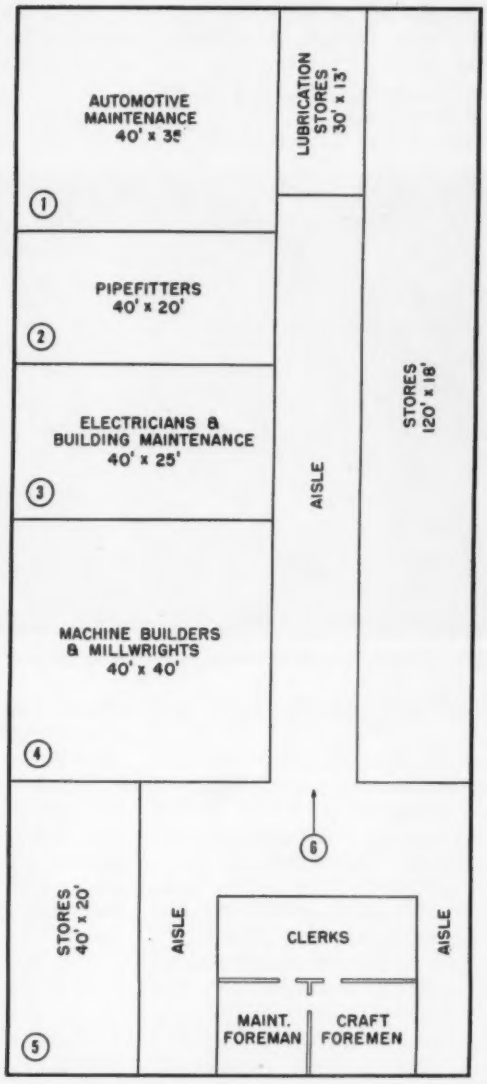
Building Maintenance Crew

The building maintenance foreman has six building maintenance men (2 class A and 4 class B) reporting to him. These men perform all of the carpentry, painting, concrete work, trench digging, furniture repair and other related work. The class A's are in the 17th labor grade and the class B's are in the 10th labor grade. Pipefitters are divided into three groups—two "specials," three class A's and 1 class B. The "pipefitter specials" perform all hydraulic system repair work and new hydraulic circuit construction work, and when not occupied with these functions work on the regular piping work with the other pipefitters. The "pipefitter specials" are in the 20th labor grade, the class A's in the 17th and the class B's in the 13th.

Reporting to the electrical foreman is a total of 20 craftsmen: 10



Line drawing, below, shows layout of maintenance shops; photographs in left column present views of various areas in the shops. As photographs and drawing indicate, each craft has separate area for work. Maintenance Foreman is in overall charge of entire bay, with craft foremen supervising and reporting on activities of their specialty groups.



class A electricians, 4 class B electricians and six power plant operators and helpers. Class A electricians are in the 20th labor grade and class B electricians are in the 15th labor grade. Three of the power plant people are classified as helpers in the 4th labor grade, two are operators in the 17th labor grade, and one is classified as a stationary engineer who, because of additional duties (such as responsibility for water treatment), is rated at the 22nd labor grade.

This total of 55 craftsmen constitutes approximately 7½ per cent of the hourly wage roll. We do not have any machinists or weldors, on the maintenance payroll, since we have a large supply of both of these skills available in our production departments. Contractual work is relied upon for helping us over peaks and for furnishing us with the skills which we do not have available.

It is our belief that supervision is extremely important, so let's find out about our supervisors. Some of the questions that will be answered are: What is their background? What kind of environment do they operate in? What do we look for in choosing our supervisors? How are they chosen?

Our Maintenance Foreman has been with our company 19 years, starting as an operator on an automatic screw machine. From this assignment, he progressed to the millwright group, the machine shop, and the tool room—his last hourly job. About three years ago, he took over as Maintenance Foreman.

Figure 2 illustrates the physical environment in which he operates. His office is private, adjacent to the one occupied jointly by his three subordinates. One purpose of the private office is, of course, to permit him to talk to his craft foremen without disturbing other people, and keep the matters confidential.

One of the first rules of good supervision is, "Don't reprimand an employee in the presence of others." With a private office, it is possible to observe this rule.

Another benefit of the private office is that it permits uninterrupted thinking and planning—a "must" for a good supervisor.

Fig. 2. Maintenance Foreman has own office for privacy in consultation, planning.

Figure 3 shows the office used by the craft supervisors. Each supervisor has his own desk. We felt it unnecessary to provide private offices, since they can use the office of the Maintenance Supervisor, if necessary.

And, it is far better for these men to be in a position to ask questions of one another, since much of the work of the maintenance department requires close cooperation between crafts. Having direct line supervisors in the same office provides the maximum amount of communications.

Our Millwright Foreman, the oldtimer of the group, as he was hired in 1920, has an almost uncanny knowledge of the equipment. This is especially important when it comes time to repair equipment for which we have no drawings, parts manuals or repair instructions. As in many plants, some of our equipment predates the day of parts manuals and machine drawings.

Our Pipefitter and Building Maintenance Foreman has been with us since 1944. Previous experience, of which he has an ample share, qualifies him admirably.

Newcomer in the outfit, the Electrical Foreman, has been with us just two years. Because we had no one to promote into this job, it was necessary to hire from the outside; this, in our plant, is the exception that proves the rule.

We go to great lengths to promote from within. To illustrate, consider the outline of our pre-supervisory program. First, published notices invite men interested in preparing for supervisory jobs to take a series of examinations. Depending on our needs, we select the number of candidates by the results of the examinations and personal interviews. These men then start a course which is approximately a year and a half in length. Instruction is given two hours each afternoon, two afternoons a week; the first hour on company time, the last hour on the man's own time. The course material was prepared by International Correspondence Schools. As vacancies occur in our supervisory ranks, they are filled by the men who have, by completing the course, shown initiative and ability.

A pertinent point — each foreman's job is covered by a job description, covering the duties, responsibilities and authority of his job. With it, the foreman knows the sphere in which he operates. Too often, without spelled-out job descriptions, one finds such things as duplication of effort, unattended areas that "someone else is taking care of," and small jurisdictional scuffles between foremen.

Two Clerks Handle Records

Figure 4 shows the clerical section of the office, where all paperwork for the maintenance department is handled by two clerks. One clerk is primarily responsible for the handling of the work order system and personnel records; the other clerk is primarily responsible for the functioning of our various scheduled systems and records.

File cabinets contain all of the

repair manuals, prints and spare parts manuals for our equipment, filed by machine number. When a craftsman requires any of this material, it is signed out to him, with the responsibility of returning it.

Shop Is Centralized

The maintenance shop, offices and stores cover an area of approximately 11,200 sq ft. All maintenance craftsmen are assigned to this one centralized area with but one exception—a very small area maintenance shop in one of the manufacturing bays that handles problems peculiar to the work in that area.

All of our maintenance people are assigned to work by means of the "Maintenance Work Authorization" form, Fig. 5. The exceptions to this are few and far between. The lower left hand corner shows that we classify our work into one of four groups — scheduled, inspection, emergency and breakdown.

Emergencies or breakdowns can be communicated to the maintenance office by telephone or a 48-station inter-office communication system. All offices and shops are equipped with either unit, so can receive and send calls to anyplace in the plant. When something goes wrong in the shops, or if they require certain work, a call is placed to the maintenance department, where a clerk is always on duty. The clerk jots down on the Maintenance Work Authorization form all the information pertinent to the job that the informant has available. Important to us are such items as type of work, craft involved, location and the urgency.

Work Form Distribution

This work form is made out in duplicate, one yellow and one pink copy. The request, which it is in this stage of the operation, is then turned over to the craft foreman for assignment. He gives the craftsman the yellow copy and retains the pink copy. When the work has been finished, the yellow copy is returned to the craft foreman by the craftsman, indicating that he is ready for another assignment. The craft foreman then sends the pink copy to the departmental foreman for his file.

Our accounting system is set up such that the maintenance department acts as an outside contractor. All material and labor charges appear as a charge against the department in which the work has been done—even our own department. Since the accounting system is set up in this manner, the man who pays the bill wants to know what he is paying for. Our regular IBM setup reports to him periodically on the various charges, but we have found that by sending the department foreman the pink Maintenance Work Authorization form as soon as the work has been completed, any charge complaints can be quickly straightened out.

The scheduled, or inspection, type of work is handled in a slightly different manner. We have a dual meaning for the word "scheduled." To us, scheduled work can mean a job which affects neither safety nor production, that can be done at a time other than the immediate present, and becomes part of our backlog. We also term as scheduled the work which is done on a predetermined regular basis—preventive maintenance. The term "inspection" means what the name implies. Thus, if in one of our predetermined regularly assigned jobs call for inspection alone, the Work Authorization is made out to indicate such.

The clerk who is responsible for the handling of our machine record system uses the visible record system as his guide. The visible record system is equipped with colored tabs so by a quick inspection he can determine which equipment or apparatus is in need of attention.

From these particular cards, he prepares the Maintenance Work Authorization form which he turns over to the appropriate craft supervisor. The clerk retains the pink copy. If the work follows through in a normal manner, the clerk receives the yellow copy after the work has been executed. However, if for some reason, the work is not done, and the clerk has not had the yellow copy returned to him, the pink copy is turned over to the maintenance foreman, who investigates the reason for delay.

Fig. 3. Craft foremen share office. Joint occupancy permits discussion of jobs.

Lubrication

Without a well organized lubrication program, a maintenance department cannot even begin to expect to keep the equipment they are responsible for maintaining in efficient operating condition. The lubrication of our equipment is taken care of by five individuals, except in the Power Plant where the operators are responsible for lubrication. Two of the five are "Machine and Equipment Lubricators," and they care for all of our machine tools. The automotive equipment is lubricated by a "Service and Lubrication Man." All electric motors are lubricated by a Class A Electrician. Our overhead cranes are lubricated by a Class A Millwright (Crane Mechanic), who is a specialist. The success of our lubrication program we believe is due to the following:

Fig. 4. Clerks are responsible for machinery record cards and work orders.

1. All equipment is lubricated on a scheduled basis.
2. Our lubricators are treated and rated as craftsmen. Their job descriptions call for them to have certain degrees of experience, education, aptitudes, and skills.
3. We have reduced the number of oils and greases to a minimum.
4. We minimize contamination by providing the proper storing, handling and application equipment.
5. Every piece of equipment in the plant was surveyed with respect to type of lubricant and frequency of lubrication.
6. Every new piece of equipment which enters the plant is surveyed with respect to its lubrication requirements prior to being placed into operation.
7. Every lubricator is thoroughly trained.
8. Prior to the inception of the program, all production department supervisors were given thorough training and orientation on the new program.
9. Paper work system for lubrication and follow-through is very simple.
10. We enjoy the spirit of teamwork between the machine operators and the lubricators.

Preventive maintenance, scheduled maintenance, productive maintenance, or systematized maintenance systems vary in degree of complexity from those capable of digestion by an average sixth grader to those needing a PhD's analysis.

Actually, preventive maintenance is something which has been practiced for years, but perhaps not as diligently followed in industry as it should have been because no one carefully analyzed the *total* cost of production.

What is our approach to this problem? To begin, information must be available on all of the machinery, equipment and other facilities which you are responsible for maintaining. This information takes the form of machinery record cards, instruction manuals, lubrication data and repair manuals. This information must be catalogued to be available when necessary. The next important facet is the decision which will have to be made concerning the extent of your program. Obviously, each program must be tailored to fit the needs of the plant.

Our machinery and equipment is divided into three categories: Critical, General, and Miscellaneous.

First on the list is the critical equipment. If any of the equipment in this category fails, some segment of our production is crippled and therefore the greatest amount of attention is focused on this equipment. In this category are such items as our power plant, air conditioning equipment, special expensive equipment which has been designed to carry out certain of our manufacturing operations, overhead cranes, fire fighting equipment. In short, we might say the items which are too expensive to have spares available. The items on this list are given comprehensive checks for electrical and mechanical shortcomings.

"General" Equipment

The equipment in the general category includes items of equipment for which we have duplicates such as the more standard machine tools, certain mobile equipment—failure of which would result in a far more negligible loss. Of course, our machine tools are periodically checked for alignment and adjusting of gibs where necessary and given other attention needed, but not the same detailed attention that is given the critical equipment.

Finally, in the miscellaneous group, we have the little-used equipment, the inexpensive equipment. It is not periodically inspected mechanically or electrically, since we have found it more economical to run the equipment until a failure occurs than to spend money for periodic checking. In all cases, however, measures have been taken for their proper lubrication.

TOTAL HOURS _____ MAINTENANCE WORK AUTHORIZATION No. 1354

INSTRUCTIONS FOR WORK TO BE PERFORMED:

Please check trolley control on overhead crane #1129

WHERE WORK ACTUALLY PERFORMED IS IN ADDITION TO OR DIFFERS FROM ABOVE INSTRUCTIONS, WRITE IN ABOVE SPACE A BRIEF DESCRIPTION OF WORK ACTUALLY PERFORMED.

CRAFT		DATE	ORDER RECEIVED BY	LOCATION OF WORK	BLDG.	BAY	DEPT. TO BE CHARGED	SHOP ORDER NO.	ASSIGNED TO:	ASSIGNED DATE
BLDG. MAINT.		9/10/57	[illegible]			10	324		229 2351	9/12/57
ELECTRICIAN	✓	GENERAL CLASS OF WORK: BUILDINGS		MACHINE NO. 1129	FACILITY		ESTIMATED TIME 2:15 hrs		TIME START 1:00 PM	TIME FINISH
MECHANIC		MATERIAL REQUIREMENTS:								
MILLWRIGHT										
PIPEFITTER										
OTHER										
TYPE OF WORK		CAUSE OF MAINTENANCE OR EQUIPMENT FAILURE:						RDT Elec. Supv. AUTHORIZED SIGNATURE		
SCHEDULED	✓									
INSPECTION								DEPARTMENT FOREMAN		
EMERGENCY										
BREAKDOWN		OTHER SIDE USED ( )						DATE COMPLETED		

FORM MM-131

Fig. 5. Typical example of Work Authorization used to schedule and assign work.

Safety Program

Generally speaking, maintenance people are more apt to encounter conditions which lead to injury than do most of the other workers in the plant. For this reason we stress our plant safety program. Once each

month the men are given a 10-minute safety talk by their supervisor on a subject which is prepared by the Plant Safety Director. The supervisors are constantly on the lookout for men who are using unsafe tools or engaging in unsafe practices.

To keep everyone conscious of safety we have developed a "reminder" practice, handled by means of our work order assignment forms. At the time an assignment is given —and in the presence of the craftsman — the supervisor stamps the words WORK SAFELY across the maintenance work order form.

Maintenance Stores

Our maintenance stores are an integral part of the plant storekeeping department. Although we have a separate area and a storeroom attendant who reports to our maintenance foreman, there nevertheless is a direct tie-in to the main storeroom. It is the responsibility of the plant stores department to keep on hand a supply of all standard parts and hardware. They order all of this material on a maximum-minimum basis—a system that assures us an adequate supply of standard items for normal operations.

Generally speaking, we do not stock anything which can be received from a local supply house at a moment's notice.

Another way to reduce inventory is to standardize. This is where the engineers, working out of Plant Engineering, play an important role by working with craft supervisors.

Perhaps at this time we might mention the part which our engineers play in assisting the maintenance group. There are three points worthy of mentioning.

1. They work with the craft supervisor in standardization wherever possible.
2. They work with the craft supervisors in redesigning, replacing, or eliminating parts which are not satisfactory.
3. They assist the craft supervisor in solving particularly touchy maintenance problems which arise in the field. Such items as circuit analysis and failure analysis are particularly fertile fields for the man with the technical background.

Our company places a great deal of importance on training—training programs start with the supervisor, and we have taken these steps: Any of our supervisors can take advanced courses in human relations, economics or some technical subject at one of the local universities, and upon receiving a satisfactory grade, be reimbursed.

We have had our supervisors attend technical sessions sponsored by industry. The various trade shows put on by industry will find Combustion supervisors in attendance. Various workshops and Engineering Institutes, where men with like problems can go to exchange ideas or listen to speakers who may help in answering some of our questions, provide opportunities for men to become better qualified for performing their jobs.

Fig. 6. Lubricants are stored in a central area, carried to machines on carts.

The craftsmen at Combustion also have available to them the services of the local institutions of higher learning as well as the evening trade courses sponsored by the local secondary schools, or, correspondence courses can also be taken with the company paying the cost, upon satisfactory completion. However, it became evident some time ago that to accomplish anything along the line of training for our craftsmen, it would have to be done on company time. Our material for these training sessions comes from several sources, one of the most important being the Audio-Visual Library of the University of Illinois.*

Other means for training craftsmen are technical sessions sponsored by various companies. One of the more recent sessions we had covered the use, care and handling of files. Other programs covered bearings, lubricants, hydraulics, etc.

Of great importance, of course, is the daily training that the craftsmen in the various categories get by virtue of assignments with more experienced craftsmen.

Scheduling and Planning

By and large, our run-of-the-mill work is scheduled and planned by our craft supervisors. As the job gets larger, more people become involved. Where two crafts are involved both supervisors discuss the matter. If a production interruption is involved, the maintenance supervisor and production supervisor get together. If engineering is involved, Plant Engineering is brought in.

Our philosophy is that, figuratively speaking, ten dollars worth of planning on a five dollar job is too much, whereas ten cents worth of planning on a one hundred dollar job is not enough. The primary objective is to minimize cost. **End**

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*One of Mr. Seidl's film training programs is fully described in "Visual Aids—A Gold Mine of Training Help" appearing on p. 100, PLANT ENGINEERING, July 1956.

Man With a Problem . . .

Man With an Idea . . .

Solution to the Problem . . .

PALLET RACKS For In-Process Parts

EXPANSION OF PRODUCTION, with no increase in building or land area, created the need for space conservation at Packard-Bell Electronics Corp., Los Angeles. This problem, experienced by many plant engineers, was solved in great measure by the construction of pallet racks in the operating and storage areas of the plant.

Packard-Bell makes 30 basic models of television and hi-fi record player sets, with three or four variations of each—a total of 100 to 120 different designs. In the plant, there may be 20 models in process of manufacture at any given time—each with 50 to 60 parts. Obviously, there exists a continual problem of providing standing storage space for all in-process small parts.

Company policy discourages warehousing of complete units; rather, they make up supplies of parts, store them, then release them to assemble sets of particular models in current demand.

Previously, numerous orders of small parts were stored on pallets, placed on the floor in areas between woodworking machines and in the aisles. (See the man with the problem, at left.) These pallets were most often stored one-high, and this type of storage used up a large amount of valuable floor space.

New Multi-Section Racks

Engineers at P-B decided to adopt a multi-section pallet storage rack system to store small parts. The system had to accommodate two kinds of storage: in-process parts orders—these were varied orders, going in many directions in the plant; the stockroom—all parts go into the main stockroom to be counted, inspected and stored, prior to assembly.

Racks were made of four-inch by four-inch fir, and stand eight feet high. One pallet is stored on the floor between the rack uprights; two or more are stored on rails in the racks. Holes bored in the rack uprights on two-foot centers permit adjustment of the horizontal rails to fit varying pallet load heights.

Individual racks are bolted together with ¾-in. bolts. Posts, where they rest on the floor, are set in four-inch lengths of pipe to protect them from damage by lift trucks moving into the racks to deposit loads.

Racks in the storage stockroom are arranged along seven-foot aisles, allowing plenty of room for truck maneuvering. Racks on the main floor area of the woodworking shop are arranged for easy access to parts awaiting particular machines. Thirteen pallet racks are now lined up near the machines, and this number is being steadily increased.

In-process storage has actually tripled, since the racks were installed; where only 120 pallets (wing-type, three by four feet) could be stored on the floor, 360 are stored in racks occupying the same floor area. Use of the racks promises considerable saving in in-plant storage costs—warehousing, trucking, damage, and supervision. **End**

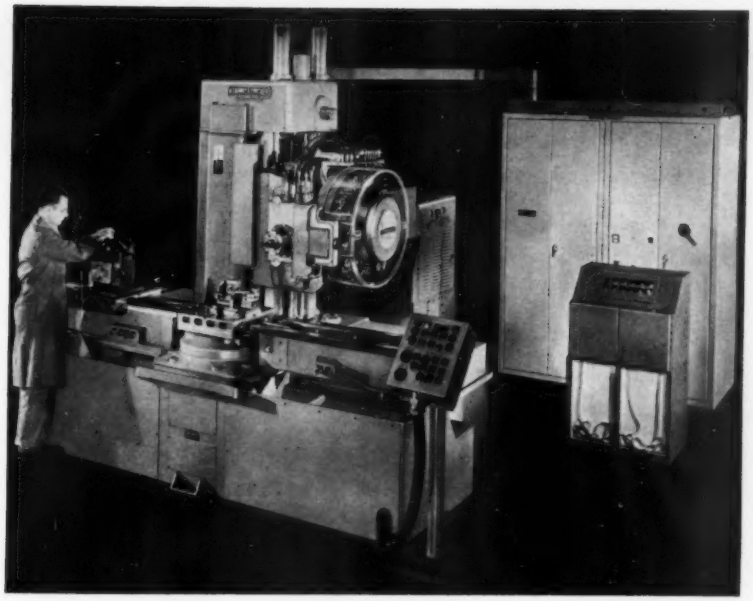


Fig. 1. This automated machine tool receives its operational instructions by way of program controls and tape reader in enclosures at the right. While one job is machined, operator can prepare another one whose movement will be by the shuttle mechanism to automatically indexed work table.

PROGRAMMED MACHINE TOOL

Tape Directs Tool Selection, Cutting Operations

AN AUTOMATIC-TOOL changing, tape-controlled combination machine that makes automation economically feasible for small-lot manufacturers has been developed by Kearney and Trecker Corporation of Milwaukee, Wis., with General Electric Company supplying the electronic program controls.

As many as 31 different tools can be loaded into the machine simultaneously—30 in a specially designed revolving storage drum and one in the spindle. There are 31 different combinations of 31 tools, ranging in size up to 2⅝-in. diameter, that can be utilized by the machine.

To make tool changes, a transfer arm automatically pivots out from its position beside the drum and removes the tool from the spindle. Simultaneously the arm takes a new tool from the drum, rotates and inserts the new tool in the spindle and places the previously used tool in the drum. The arm then returns to its normal position. See Figs 2 to 5. Less than nine seconds are required for tool changes.

The control system makes the tool selection and directs the work-piece transfer. If the programmed tool has not been loaded into the drum by the operator, the drum will continue to revolve until it is stopped and the proper tool is inserted. Engineers pointed out that tools carry a binary code and can be placed at any position within the drum regardless of the sequence in which they are to be used. Mechanical "fingers" pick out the tools and signal the control to stop the drum when the desired tool is in position to be removed by the transfer arm.

In operation, the work table is automatically indexed to present work-piece surfaces to the spindle. The spindle moves longitudinally, vertically, and to depth. Feed rates range from 1 to 99 ipm and are selected in increments of 1 ipm. Spindle speeds from 100 to 4000 rpm are selected in increments of 10 rpm.

As the spindle is used for tapping, a complete reversal requires 0.1 sec at 100 rpm and 0.4 sec at 400 rpm. Acceleration of the feed drives to 100 ipm is accomplished in 0.05 sec. Where feed rates are not specified, positioning is done at 200 ipm.

The tailor-made control system not only directs positioning of the work table and the three-axis spindle; it also controls tool selection, tool changing, spindle speed, feed rate, and auxiliary functions such as turning coolant on and off when needed.

For longitudinal and vertical positioning, the control is expected to make possible absolute positioning accuracies of plus or minus 0.0005 in. and repeat accuracies of plus or minus 0.0002 in. Spindle depth positioning is accomplished at an absolute accuracy of plus or minus 0.001 in. and at a repeat accuracy of plus or minus 0.0003 in. Since the system is absolute, there is no accumulation of error in positioning.

Slope and arc cutting can also be performed by the machine. According to General Electric engineers, this feature does not introduce control complexity, nor difficult tape preparation problems requiring computers.

(Turn page)

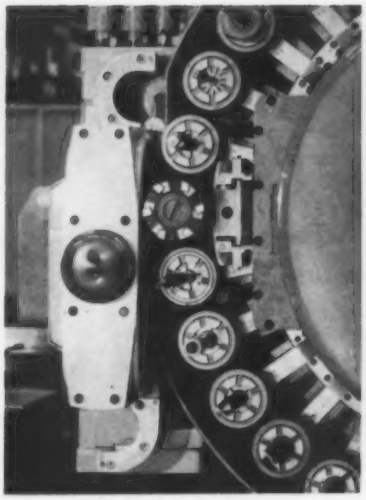


Fig. 2. Rotary magazine holds 30 tools; each one is chucked in a coded holder.

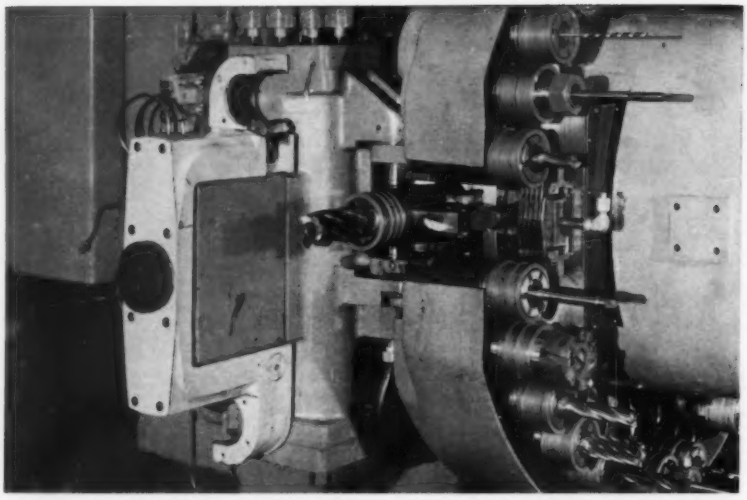


Fig. 3. The tool change arm has been moved 90 deg from position shown at left; the milling cutter also rests at an angle of 90 deg from its magazine location.

The machine will perform circular cutting of radii from 0.1 to 9.9 in. in radius increments of 0.1 in. The maximum error on arc milling is plus or minus two per cent of arc length. Maximum speed for arc and slope cutting is 30 ipm for radii between 0.5 and 9.9 in. According to design engineers, the control permits users to mill clearances, "walk" around joint faces, and perform similar jobs where high accuracy is not required.

First step in processing a part for the machine consists of listing dimensions, machining sequences and auxiliary functions on a simplified planning sheet. To do this, the engineer or technician takes the necessary information from an ordinary blueprint. Then a typist, using a standard typewriter-tape punch, transcribes the planning sheet data.

To provide a visual check of the accuracy of the transcription, corresponding numbers are typed onto the planning sheet at the same time they are being punched into the one-inch, eight-channel input tape. After checking the typed number against those originally placed on the planning sheet, the tape is ready for use. If corrections are necessary, changed data can be quickly spliced into the tape.

At the machine, tape is read by a standard mechanical tape reader. The control system is equipped with dual storage registers to eliminate any loss of machine time.

A push of a button is all that is required to put the versatile combination machine into operation. Once started, it will continue to function automatically until the programmed job is completed. While the machine is in operation, the operator is free to prepare the next workpiece for production and to select the necessary tools required if a new part is to be machined. This makes possible a complete changeover in minimum time. **End**

Fig. 4. In process of making a switch arm rotates from a vertical position.

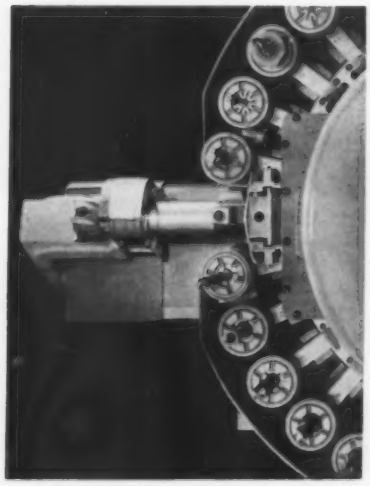
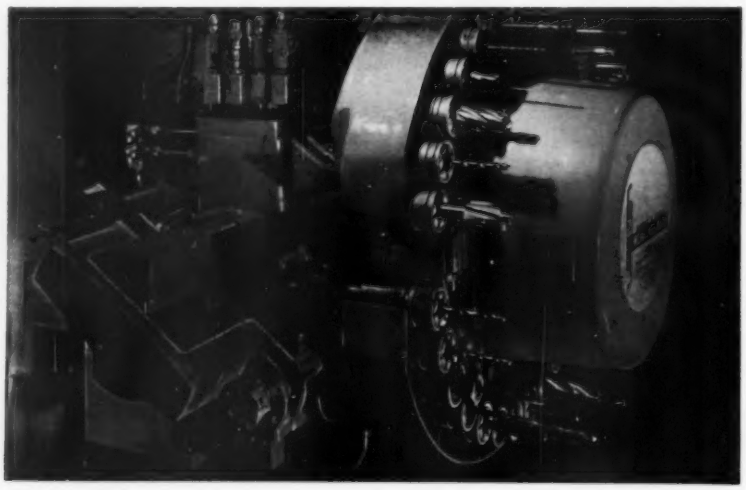


Fig. 5. As the tool change arm continues in its rotation, it removes the tool from the rotary magazine as well as the one in the spindle of versatile machine.



MECHANICAL SEALS—
Design, Operation, Selection and Application

By JACK C. MASON, Engineer, Standard Pump Division, Worthington Corp.

IT IS IMPORTANT to select the proper mechanical seals for the various pumps in your plant.

The following information on the types of seals, the modifications available and the number of materials which can be used will provide you with a working knowledge of mechanical seals.

The basic mechanical seal, Fig. 1, consists of two parts, each with a polished sealing surface at right angles to the shaft. The stationary member is fastened to the casing and the rotating member is fastened to the shaft. Highly polished wearing surfaces on both members do the sealing.

Lubrication of the seal faces is required to prevent scoring and heating. Leakage across the faces, however, is so small that it is not noticeable in most cases.

The sealing faces are held in contact by means of a spring, and usually only an initial adjustment, when installing the seal, is necessary.

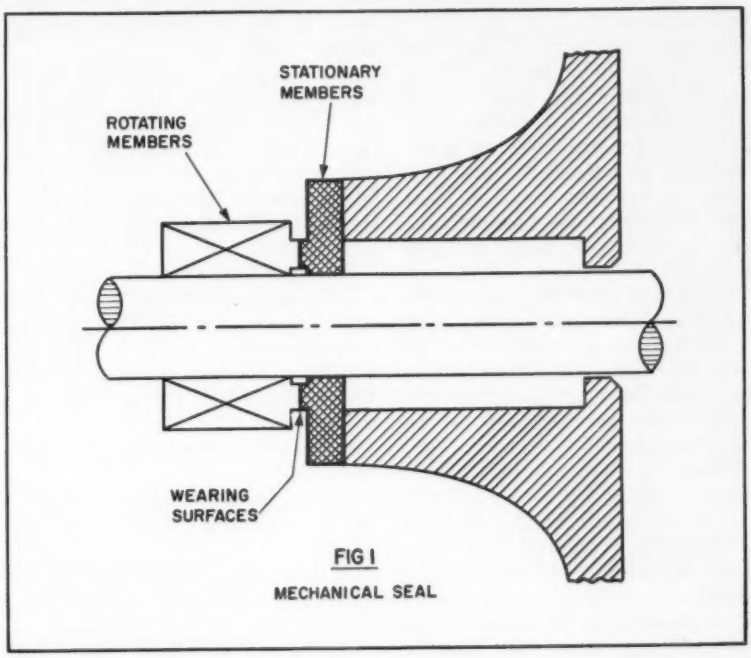


FIG 1
MECHANICAL SEAL

Figure 2 shows the two most common types of mechanical seals being used today. Basically their function is the same, although they operate somewhat differently, as we will see later.

Before discussing the over-all operation of the seal, we must consider the surface on which it will be mounted—the shaft or shaft sleeve.

All mechanical seals must be mounted on a smooth shaft or shaft sleeve free from burrs or score marks. This means that if a packed stuffing box pump is to be converted to a mechanical seal in the field, it will be necessary to replace the shaft or sleeve.

In addition, in the shaft packing type seal, the surface must be of a suitable material that will not corrode or in any way prevent the shaft packing from moving along the shaft. Generally, this will require a solid stainless steel shaft or a bronze or stainless steel sleeve.

Let us first look at the shaft packing type seal, Fig. 2. These are manufactured in two designs, one consisting of the separate components mounted individually on the shaft as shown in Fig. 2A. The other is known as the cartridge type. All the parts are basically the same as the first except that they are held together in a metal frame, shell, or cartridge. There is an advantage in this, in that it is sometimes easier to install.

The seal manufacturer specifies the location of the seal on the shaft to be sure of the proper spring compression. This location is generally based on a measurement from the face of the stuffing box or other reference point such as the stationary face. Once this point is located and the seal properly installed, it is not necessary to make any further adjustment.

As the seal faces wear, the rotating face, shaft packing, and compression ring move along the shaft toward the stationary face. The amount of this movement depends on the size of the seal and is about 1/16 to 1/8 in. at most on the smaller sizes before replacement of the faces is necessary.

The back-up ring is held in place on the shaft or sleeve by setscrews. In order to insure that the springs, compression ring, and

rotating face rotate with the shaft and at the same time are free to move along the shaft, the parts are interlocked by pins or notches.

The most critical sealing point is between the stationary and rotating faces. See Fig. 1. Here the sealing is accomplished by two highly polished flat surfaces running against each other. Flatness is normally 35 millionths of an inch and the finish such that the irregularities of the surface are only about five millionths of an inch. If the irregularities are too deep, leakage will occur across the seal faces.

On the other hand, if they are not deep enough, then the faces will not retain the liquid being sealed and there will not be sufficient lubrication. The optimum condition is where the liquid is contained between the faces. Most operating conditions, however, are not optimum and there is some leakage.

On initial start-up, some leakage may be apparent, but normally this should taper off as the faces become mated. Though there may still be leakage across the faces, it may evaporate or be too small to detect.

There are two other points where sealing is required. They are between the stationary face and gland by means of a seat ring, Figs. 2B and 2C, and between the gland and stuffing box by means of a gasket. In the case of the clamp-in type seat, Fig. 2A, the gland gasket also seals the stationary force.

Operation of the bellows type seal, Fig. 2C, is similar to the shaft packing type. The difference is that the bellows do not have to slide along the shaft as the faces wear, as does the shaft packing. That portion of the bellows in contact with the shaft remains firm and the folded portion expands toward the sealing faces.

One other purpose of the bellows in some types is to act as a friction ring to prevent the seal from turning on the shaft. This is only on those seals which do not have pins or notches anchoring them to the back-up ring which fastens to the shaft.

The previous discussion has dealt with the two basic types of mechanical seals. Each can be classified further according to location, arrangement and design.

By location, we mean whether the seal is mounted internally or externally.

Internal Seal—The rotating assembly is located in the liquid being pumped, Fig. 3. This is the arrangement generally used except in chemical service where the tendency is to use an external mounting.

Advantages of an internal mounting are:

1. Can be used on high pressure as the seal faces are forced together.

2. Seal parts are not exposed to abrasive or corrosive atmospheric conditions.

3. Cannot be easily tampered with by inexperienced personnel as the parts are inside the pump.

4. More easily modified to handle extremes in operating conditions.

5. Available with added safety features.

6. Can be applied where space is limited.

External Seal—Rotating assembly is located outside the liquid. The seal is normally mounted outside the stuffing box, although it can be located within the box. See Figs. 4A & 4B.

The advantages of an external mounting are:

1. Easily installed and adjusted as parts are readily accessible.

2. On abrasive or corrosive service, the parts are not rotating in the liquid where chance of failure is increased.

The next classification is single or double type seal.

Single Seal—As the name indicates, it is a single seal installed in the pump. This is the most common arrangement.

Advantages of single seals are:

1. Less expensive, about half the price of a double seal.

2. Easily installed and maintained.

3. Require less space.

Double Seal—The double seal consists of two single seals installed in the stuffing box. See Fig. 5.

Advantages of double seals are:

1. For toxic or hazardous liquids where any leakage to the atmosphere would be dangerous.

2. Where there is an extremely abrasive condition.

With a double seal, provision

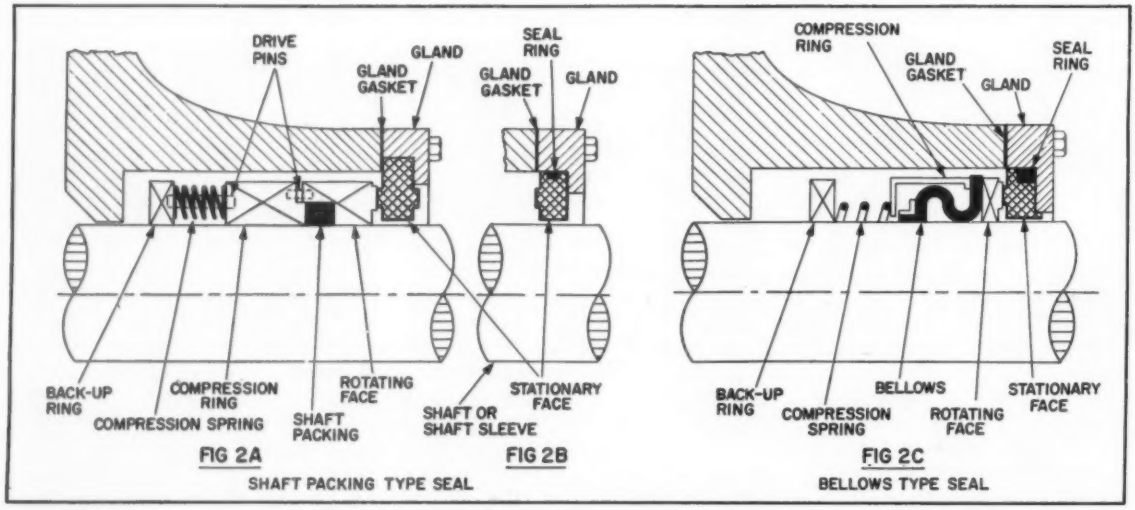


FIG 2A FIG 2B

SHAFT PACKING TYPE SEAL

FIG 2C

BELLOWS TYPE SEAL

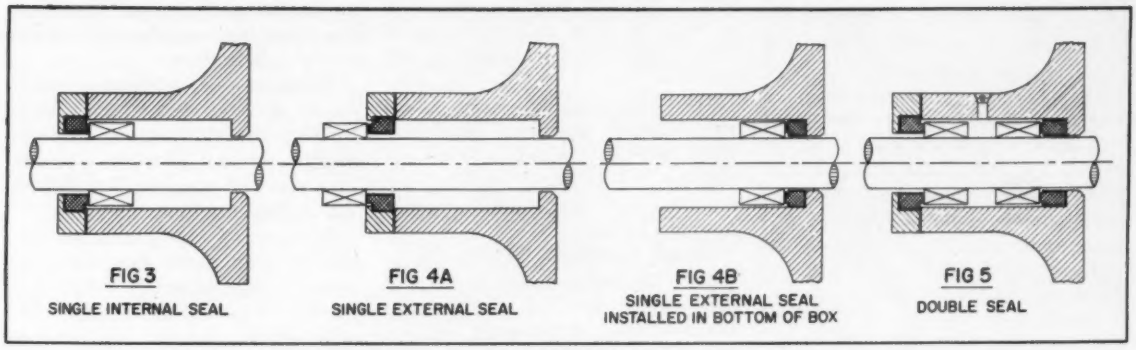


FIG 3
SINGLE INTERNAL SEAL

FIG 4A
SINGLE EXTERNAL SEAL

FIG 4B
SINGLE EXTERNAL SEAL
INSTALLED IN BOTTOM OF BOX

FIG 5
DOUBLE SEAL

must be made to introduce a liquid between the seals at somewhat higher than suction pressure. Furthermore, liquid should be circulated to prevent overheating in the stuffing box and provide sufficient lubrication. A separate recirculation unit may be necessary for this purpose. Since this could become a costly arrangement, a modified single seal may be preferred.

Seal designs are also classified as balanced and unbalanced. With the unbalanced seal, the stuffing box pressure acts on the whole of seal face and with the balanced type the pressure acts only on part of the face.

Unbalanced Seal — Considering an internal seal, Fig. 6A, we see that the stuffing box pressure (a) acting on the rotating member forces the faces together. Added to this is the spring pressure. However, since there is leakage of liquid across the faces, there must be pressure in the liquid and this pressure will tend to force the faces apart as at (b). The magnitude of this force (b) is about half the liquid pressure in the stuffing box as it enters the faces at box pressure and leaves at atmospheric pressure. This, in effect, creates a wedge type force pushing the faces apart.

As the stuffing box pressure increases, the resulting pressure acting over the rotating sealing face area becomes greater and the wedge force (b) becomes less effective. This results in film breakdown between the faces and little or no lubrication. Seal life, therefore, may be shortened considerably.

Pressure alone, however, does not dictate when a seal will fail. The liquid itself is an important factor, and in most cases there is enough lubricating value to permit operating with stuffing box pressures as high as 125 to 150 psi. Hydrocarbons with very low specific gravity (below 0.7) generally do not lubricate sufficiently, and it is necessary to use a balanced seal even under low pressures.

The externally mounted unbalanced type seal is limited to considerably lower stuffing box pressures, about 30 to 35 psi. Here the problem is due to both the box and film pressures tending to push the faces apart. Opposing them, we have only the seal spring pressure.

Balanced Seal—We saw from the unbalanced seal that the face pressure can reach a point where no lubricating film will remain between the faces.

Consider Fig. 6B, where the shaft is provided with a step or shoulder. Here, as in the unbalanced type, the stuffing box and spring pressure act against the rotating member while the film wedge (b) tends to force the faces apart.

The face width (f) may remain unchanged, though it is smaller in diameter. The difference, however, is that the rotating member has equal pressure in both directions beyond diameter D and there is a hydraulic balance in this area. Effective stuffing box pressure now acts only on the portion (g) of the seal between the shaft and diameter D. Since there is little change in face area, the face pressure also reduces.

By the location of the effective pressure area (g), the amount of face pressure may be controlled. The farther away from the center of the shaft, the greater the face pressure. On the other hand, it is possible to go to an extreme condition where the film wedge (b) opening the faces is greater than the combined spring and effective stuffing box pressure (g). This happens as the location of the area (g) moves toward the center of the shaft.

A modification of the balanced seal is available without a stepped shaft as in Fig. 6C. The radial location of the sealing faces and the amount of face relief (c) determine the balance.

It was mentioned previously that one of the advantages of a mechanical seal is that it is available with a number of modifications and arrangements. These permit it to operate over a wide range of conditions.

Most modifications are relatively inexpensive if initially fur-

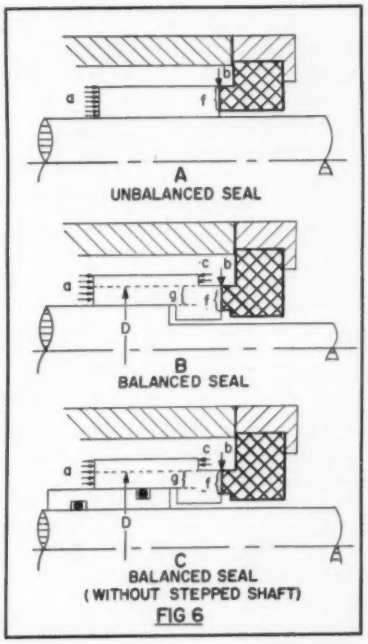


FIG 6

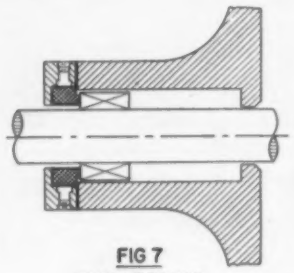


FIG 7
GLAND COOLING

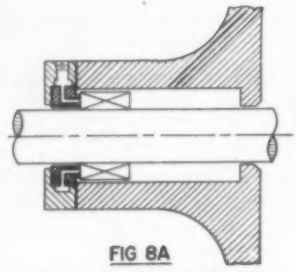


FIG 8A
FACE LUBRICATION, DEAD END

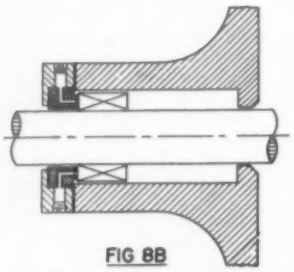


FIG 8B
LUBRICATION, RECIRCULATION

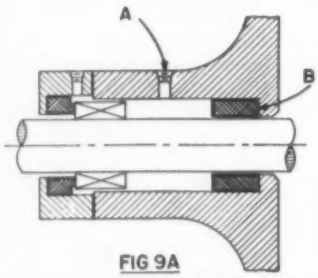


FIG 9A
FLUSHING INSIDE SEAL AND THROTTLE BUSHING IN BOTTOM OF BOX

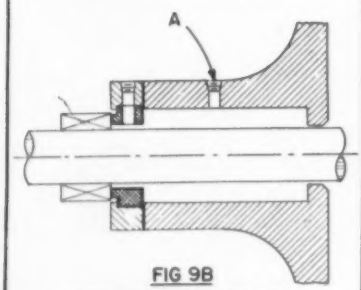


FIG 9B
FLUSHING, EXTERNAL SEAL

nished with the seal. Therefore, it is wise to give consideration to special features when applying the seal.

The following are the basic modifications normally available. They are not limited only to extending the physical coverage of the seal but also include safety features as well.

Gland Cooling — This helps to reduce the temperature of the seal faces which heat up due to high temperature of product and/or frictional heat generated by the faces, Fig. 7.

The arrangement consists of an annular groove in the gland with inlet and outlet connections. Cooling liquid, generally water, is circulated through an in and out connection. The coolant is in direct contact with the outside surface of the stator.

It is available on internal, external, single, unbalanced or balanced seals.

Note: Gland cooling is normally not furnished on double seals as the liquid between the seals may serve the dual purpose of lubricant and coolant.

Face Lubrication—Type I, Fig. 8A, may be used to lubricate the seal faces where there is a vacuum which tends to pull air across the faces. It can also be used where the seal may run dry or for mildly abrasive conditions.

Type II, Fig. 8B, may also be used for the above reasons when a more abrasive condition is encountered and where cooling is required across the faces.

Type I consists of an annular groove in the gland with inlet connection only. Lubricant is forcefed through the series of passages in the stator to the seal faces. This is dead-ended lubrication.

Type II consists of inlet and outlet connections in the gland which line up with two passages in the stator. Two passages lead to an annular groove in the sealing face of the stator. Lubricating liquid enters the inlet, flows through the passage in the stator to the annular groove, around the groove and to the outlet passage. This is circulating lubrication.

These are available on internal, external, single, unbalanced or balanced seals.

Note: Lubrication is not normally furnished on double seals as the liquid between the seals serves as the lubricant.

Flushing — A flushing arrangement will circulate the liquid through the stuffing box to carry away heat and prevent temperature rise and possible liquid flashing at the seal faces.

It prevents solids from settling out of suspension and also prevents solidification in the box of liquids which might crystallize with slight change in pumping temperature. The flushing liquid may be the product handled or a solvent liquid from an independent source.

The internal seal, Fig. 9A, consists of an inlet connection located in the gland so that the bypass liquid is opposite the seal faces.

An external seal, Fig. 9B, consists of an inlet connection located in the gland and passage through the stator. In both cases this arrangement permits flushing liquid to sweep the complete length of the box and prevent any stagnant spaces. Alternate arrangement consists of bypassing the discharge by means of internally drilled passages or external piping at point A.

When a fluid other than the pumped product is used, a close clearance throat bushing, B, is installed in the bottom of the stuffing box. This throttles the amount of liquid used and helps to prevent dilution of the product. It also helps keep solids from getting to the seal.

It is available on internal, external, single, unbalanced or balanced seals.

Note: Liquid between the seals on the double seal arrangement serves basically the same purpose.

Quenching—Quenching is used to cool the outside seal or remove any leakage which might crystallize on the faces when in contact with the air. On vacuum service, the quenching liquid acts as a lubricant and seal between the mated faces. If it were not used, air would be pulled across the faces with the result that they would run dry and fail.

Quenching consists of an inlet and outlet connection in the gland and opposite the seal faces. Liquid from the inlet washes over the outside of the seal faces and

through the outlet. By regulating the flow of quenching liquid, all of it will drain through the outlet rather than through the close clearances between the seal rotor and gland. See Fig. 10.

It is available on external, single or unbalanced seals.

Vent and Drain — These are safety features on internally mounted seals. They prevent the liquid from spraying along the external portion of the shaft in event of seal failure. They are also used as a quench arrangement on an internal seal. In the event of a seal failure and with the auxiliary stuffing box arrangement, the pump may still be run. See Fig. 11.

Arrangement consists of an annular groove in the gland with inlet and outlet connections, vent and drain. Gland also has throttle bushing or auxiliary stuffing box.

They are available on internal. single, unbalanced or balanced seals.

Note: Normally not required on a double seal.

Water Jacketed Stuffing Box— Not a mechanical seal feature but it may be required to help control the temperature.

It provides additional cooling to that obtainable with gland cooling arrangement. It is generally required on higher temperature service. It is also used where the pumped product may solidify on cooling. Steam or hot liquid is circulated through the jacket to insure that the product stays fluid and does not crystallize.

Arrangement consists of a jacket around the stuffing box with inlet and outlet connections. See Fig. 12.

It is available on internal, external, single, double, unbalanced or balanced seals.

Pumping conditions may be such that more than one modification may be required to insure proper seal operation.

Material — First, consider the most critical part — the sealing faces. Not only does the development of a suitable material for this use depend upon its corrosion resistance and stability under temperature changes, but such things as wearing qualites and sealing ability are equally as important. A number of materials such as carbon, cast iron, bronze, Ni-Resist, Stellite, glass or carbon filled Teflon, ceramic and others are used under varying conditions.

While there is no one material or combination of materials suitable for each and every application, some of the more common are carbon rotating against cast iron or Ni-Resist for the non-corrosive conditions and ceramic or Stellite against carbon for chemical applications.

The next most important seal part is the shaft packing or bellows which is available in the synthetic rubbers such as Buna or neoprene and in silicone rubber. These materials are available for both the shaft packing and bellows type seal and are particularly adaptable to the latter, where flexibility and material cost are important considerations.

Though extreme temperature and poor resistance to chemical attack may limit the application of synthetic rubber, it is by far the most used material for general service conditions.

Where there is a high or even a very low temperature or where there is a corrosive condition, materials such as Teflon are necessary. Teflon, however, is normally limited to the shaft packing because it does not have enough resiliency for most bellows type designs. When special metal parts are also required, cost becomes a factor and this type seal is usually recommended for some of the most critical applications.

The rotating assembly should at least be equal to the casing material and it is even desirable to have it of a better material. It should be remembered that the rotating assembly is more susceptible to corrosion, due to its high velocity in the liquid. The springs in particular are susceptible to corrosion, since they are heat-treated. Therefore, they are generally of stainless steel.

The gland should be at least the same material as the casing. If the liquid is corrosive when in contact with the atmosphere, the gland should be of a suitable material which will withstand product leakage.

To insure the selection of the proper type of seal, its materials and special features which may be required, it is important to know the fluid handled, specific gravity, suction or stuffing box pressure, speed in rpm, and temperature. Also, whether there are any solids present—and, if so, then quantity, size and type. **End**

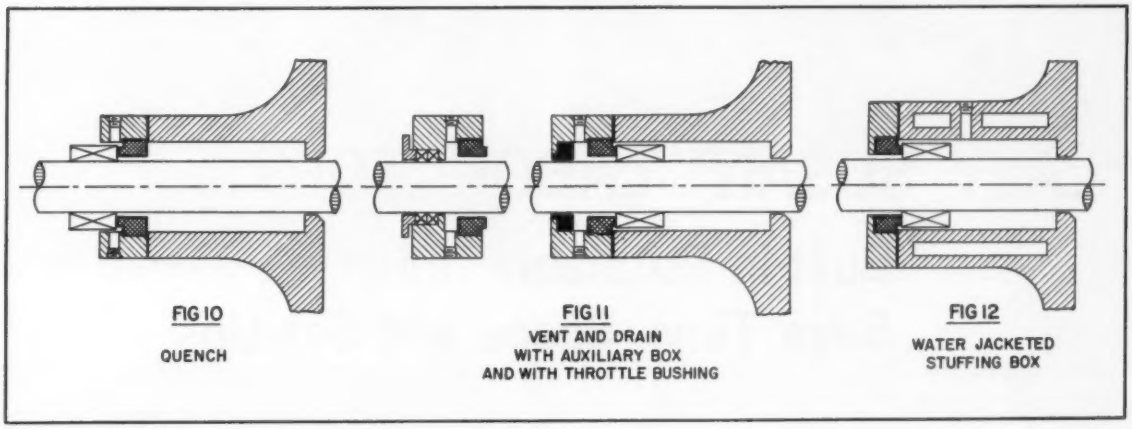


FIG 10
QUENCH

FIG 11
VENT AND DRAIN
WITH AUXILIARY BOX
AND WITH THROTTLE BUSHING

FIG 12
WATER JACKETED
STUFFING BOX

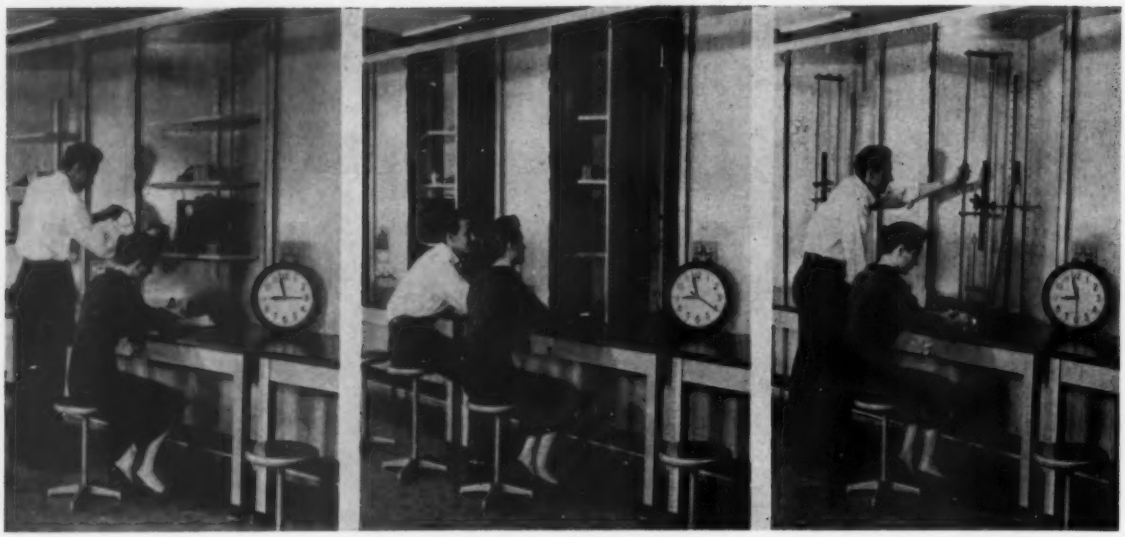


Fig. 1. Second hand of clock shows sweep of 15 seconds while rotor unit moves different equipment into laboratory.

"LAZY SUSAN" LABORATORY

Built-In Rotatable Units Save Time, Space and Set-Ups

WITH THE FLIP of a switch, a new quick-change laboratory can be made to serve a variety of subjects or individual needs without dismantling or removing experiments already set up and in use.

Key to the laboratory's versatility, now in use at the University of Illinois, Navy Pier Branch, Chicago, is a built-in, automatically rotated turntable which delivers one set of equipment "on stage" while a previously-used set disappears into the wall. The laboratory was conceived and developed by Professors O. L. Railsback and Harold M. Skadeland of the University's physics department.

The design is based on an assembly of units, each of which consists of a laboratory table top into which is built a circular "turntable" divided into three segments by vertical walls, see Fig. 1. The turntable may be rotated through 360 deg to bring any one of the three compartments into position to become an integral part of the laboratory table.

A low power, electric motor antenna rotor was geared down and used to operate each turntable. The ac motor drives a reduction gear which turns the unit at the rate of about one revolution a minute.

Each rotor unit is held in locked position by a bolt inserted by spring action. The bolt is withdrawn by operation of a solenoid which simultaneously closes a switch in the motor circuits.

All motor circuits are limit switch controlled to stop at any one of the three selected positions. The solenoid is then released and the bolt returns to the locked position of the unit, simultaneously opening the circuit of the motor unit.

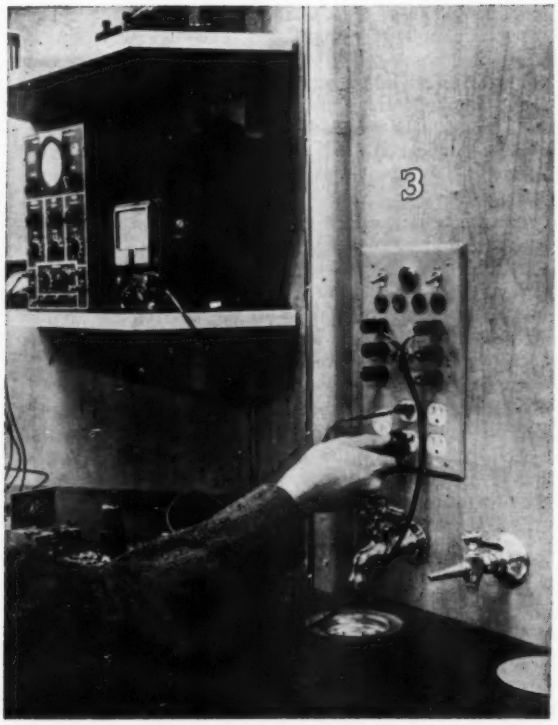
The units are controlled and operated either individually or in unison from a control panel, Fig. 5.

One set of utilities serves all positions of the rotor unit. Each station is equipped with gas, water faucet and drain, and electrical outlets with variable voltage outputs, as shown in Fig. 4.

The complete units can be arranged as a single, long laboratory bench, which permits their loading and unloading from an adjoining store room, Fig. 2, or they can be placed in pairs at right angles to a wall. In this case, there is no associated storage space, but the segments of the turntable not in use revolve into a glass and wood housing.

The installation was made by the Physical Plant department of the University, while the Hamilton Manufacturing Co., Two Rivers, Wis.; the Micro Switch Co., Freeport, Ill.; and the Oak Manufacturing Co., Chicago, Ill., contributed equipment to the laboratory. **End**

Figs. 2 and 3. Shelves of rotor unit can be loaded or unloaded in adjoining storeroom, below, without interfering with work or experiments in progress in laboratory, right.



Figs. 4 and 5. Each station is equipped with utilities including electrical outlets with variable voltage outputs. Control board, below, is for all stations.

NEW CLUTCH HAS A LOT OF "NO'S"

NO Slip Rings
NO Brushes
NO Air Gap Adjustment

Fig. 1. Heart of new clutch is angular-split air-gap which converts part of thrust load to bear against radial bearing.

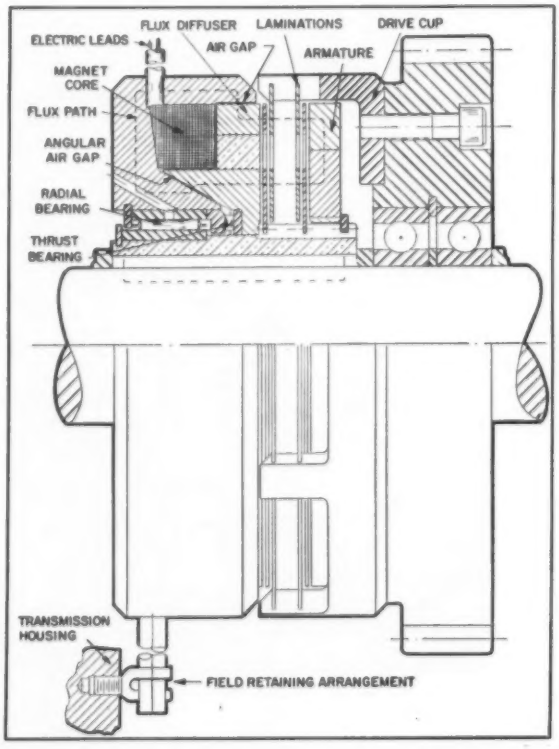


Fig. 2. Construction details are shown in this drawing which illustrates the relationship of the bearings and air gaps.

MANY industrial plants may soon be using this new stationary-field magnetic clutch which provides more torque for size than other units now commercially available.

The manufacturer claims this clutch is virtually maintenance-free because of its special design. The new design, incorporating a closed flux path through hardened steel laminations, eliminates the need for adjusting air gaps. Use of a stationary magnetic field—coil windings are on the stator instead of on the rotor—eliminates slip rings and brushes.

Where can these clutches be used? Manufacturer says in the machine tool field, for such jobs as speed-changing, feed drives and brakes and as couplings in drive systems of lathes, boring mills, planers, milling machines and grinders.

However, these clutches open up many new possibilities for use in drive systems of a wide range of other equipment. These include machines for such jobs as washing, pulverizing, printing, packaging and strapping and more specialized equipment such as conveyors, welders, wind tunnels, nuclear control mechanism, radar antennas, test equipment and steel rolling mills.

The clutches are available in five sizes with torque ratings ranging from 14 through 290 lb-ft. They can be operated on a standard 24- or 90-volt power source.

One advantage of the clutch is its single-unit construction which permits fast installation. The stationary portion of the clutch is secured from rotation by a single threaded rod which screws into a tapped hole in the magnet body.

Other design, construction and performance features are: 1. long-life bearing design; 2. low-inertia design for minimum flywheel effect; 3. multiple control voltages available; and 4. ease of adaptability through use of an external drive cup.

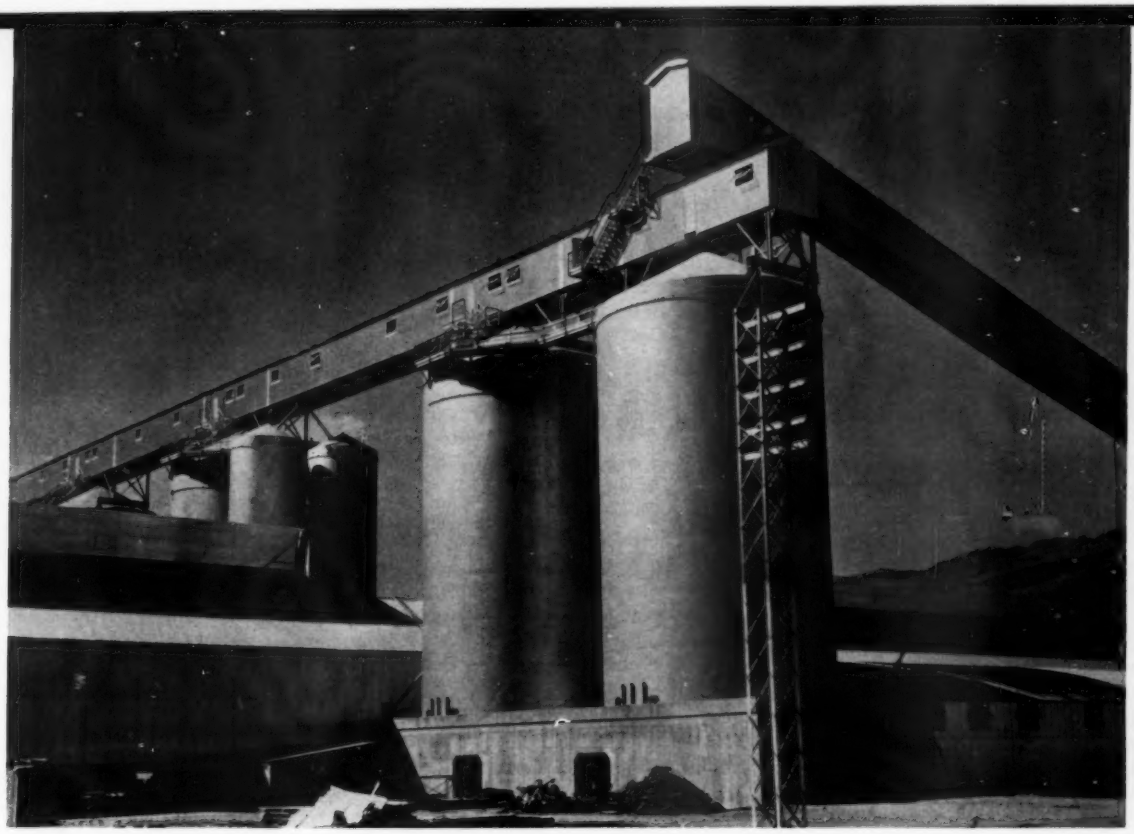
Much of the new clutch design evolves from the special consideration given to thrust loads. In designing the clutch, the manufacturer did not seek to eliminate the loads caused by stray flux. Instead, a longer air gap—shaped like a cone—was oriented approximately 30 degrees relative to the shaft axis. In doing this, thrust load on the roller thrust bearing was reduced appreciably by converting a portion of it to bear against a radial needle bearing.

Open construction is another design feature of the clutch which provides a two-fold advantage. Oil can enter around the radial bearing, and the angular-split air gap acts like a pump to flush the bearing area and dissipate coil heat.

Rotating elements of the clutch have been kept to a minimum to reduce over-all inertia so that flywheel effect of the clutch on the transmission is negligible. **End**

Additional Information

If you would like more information about this clutch, just write The Editor, Plant Engineering, 308 E. James Street, Barrington, Illinois, or indicate "Magnetic Clutch" on the post card in this issue.



Bulk Storage Goes Undercover
Take Your Pick of Enclosures

By A. T. GAUDREAU, Consultant, Gaud-Reau Associates, Westport, Conn.

SILOS, BUNKERS and cylindrical tanks are rapidly helping to change storage of flowable bulk materials from inside the plant to the plant yard. They protect those materials which tend to be affected by weather conditions; when used in batteries, they can handle volumes of bulk material as large as are being stored in open stockpiles in many plant yards; and they permit the removal of unsightly piles of material from the yard.

These storage units usually receive materials by overhead belt conveyors and bucket loaders feeding into the tops of the units. The bins deliver the stored materials at any time, in necessary quantities, to a convenient spot, such as by gravity through a bottom hopper, for subsequent consumption.

In plant yards, silos provide bulk storage facilities for the maximum possible volume of materials per square foot of ground space required.

The storage capacities of industrial silos range from 15,000 to 50,000 cu ft per unit, and their dimensions range up to 30 ft in diameter, and to 100 ft in height. They will handle a wide variety of materials, ranging from 16-in. coal lumps down to No. 200-mesh phosphate rock dust. It is common practice to use belt conveyors leading to and from these structures. Skip hoists and bucket conveyors are frequently used for loading the material into storage. Other mechanical handling devices used with silos are hydraulic systems, vibrators, and pneumatic systems.

Circular vs rectangular silos. When the flowability of the stored material permits, a silo can be constructed in either a circular or a rectangular shape. From the standpoint of economy of construction and use, a square bin frequently costs about 50 per cent more to build than a round one, but has a storage capacity about 27 per cent greater. Space limitations may occasionally rule out the conventional round silo. Rectangular silos are also more adaptable for use as part of a building. The bin walls themselves can be used as an outside corner of a building. Another advantage of a rectangular bin is that the bin can be equipped with a hopper bottom and a long-slotted opening. This type of opening greatly reduces the tendency of some bulk materials to form an impenetrable compacted arch, as occurs above other types of bin openings.

Structural types. Silos are usually permanent structures which are erected on a ground-level base or on

an elevated pedestal or platform. Discharge tunnels can be built into either the base of the foundations or the base of the silo. The silo foundation can also serve as the floor, or the latter can be built up separately. Floors can be sloped for gravity discharge through the side or bottom of the silo. Machinery floors may also be built inside the silo to house conveyor, elevator or collector equipment. Some silos are constructed with inside storage shelves at angles for live or reserve storage facilities, see Fig. 2. The body of a silo can be made of wood, concrete, tile, or steel. For silos of similar design and size, wooden types may cost considerably less than the others.

Wooden silos are one of the oldest types of bin for storing bulk materials. Heavy timbers form the main supports with tongue-and-groove planks nailed inside the bin to make it air-tight. The principal use of wooden silos in industry is for the storage of relatively small quantities of bulk materials such as coal, clay, and crushed rock. Because of the wood's inherent weakness—shear—especially along the grain, the wooden silo requires much skill for the design of an economical structure. Furthermore, unless carefully anchored, wooden silos may twist, tilt, slide, or even collapse in a heavy windstorm.

Concrete silos may be constructed with poured concrete or with precast concrete staves. Poured concrete silos are made with a thick wall which is heavily reinforced with steel capable of withstanding extreme pressures. Compared with other materials for silo construction, reinforced concrete usually has the highest first cost and the greatest life expectancy, and provides the strongest structure.

Concrete-stave silos likewise possess both strength and permanency, but cost considerably less than reinforced concrete construction. This type of silo can handle a wide variety of materials, ranging in particle size from 16-in. run-of-mine coal to phosphate rock dust of No. 200 mesh and smaller.

Concrete silos are mostly adaptable to the cylindrical shape, and are usually designed for handling specific materials. Because of the relatively heavy weight of the large amount of concrete used in their construction, concrete silos may give rise to increased construction costs over other types of silos when elevated above the ground level.

Tile silos. Tile-stave silos are used where maximum economy is desired, and where the silo wall mortar will not be affected by chemical reaction from the stored material. With the use of a proper quality of fire clay, the resulting tile is a glazed stave or block which is capable of withstanding extreme strains and weather conditions. The dead air space in the hollow tile prevents frost, excessive heat and moisture. The web reinforcement between the air spaces imparts added load-bearing capacity to the wall against expansion or internal pressure.

Steel silos. Among the most widely-used types of silos in industry are those made of steel. A steel silo can be designed in an endless number of shapes and sizes to suit most bulk-storage needs. The most economical design for storage purposes is the vertical cylindrical unit with either a flat or conical bottom. Sometimes steel water tanks or discarded cyclone separators may be converted into satisfactory silos at a comparatively small cost. Small steel cylindrical silos may be purchased in prefabricated form ready for temporary erection as one unit for the storage of sand, etc.

Bunkers differ from silos in that they are smaller in capacity, are positioned overhead on a pedestal or in suspension, and may be portable and semi-portable as well as permanent at point of use. In common with silos, bunkers may be constructed of wood, concrete, tile or steel, and may be cylindrical or square in shape, as well as either vertical or horizontal in operating position. Steel bunkers are generally used for storing industrial materials.

Bunker Types, Applications

Bunkers may be classified into three categories according to shape or form.

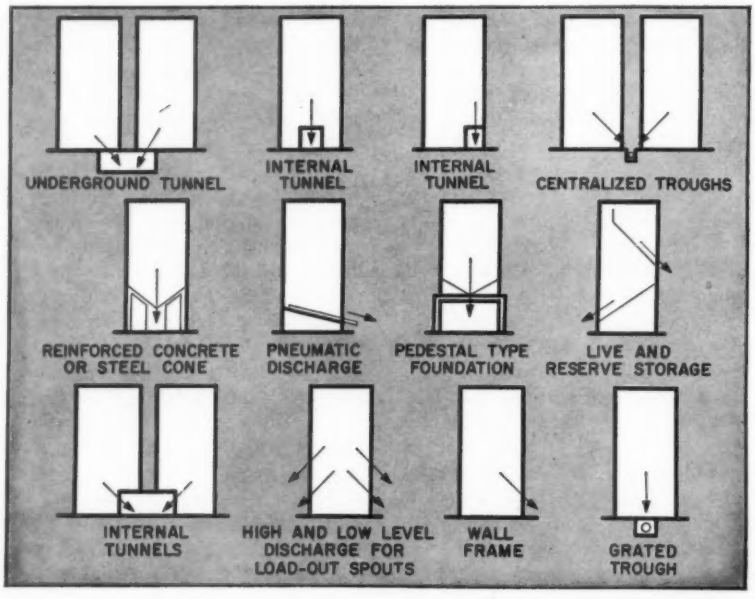
Cylindrical bunkers are sometimes called circular bins. Cylindrical bunkers are low in first cost and take up a small amount of space. The material moves each time the bunker gate is opened. As a result, there is practically no compacting or segregation of material inside.

Rectangular bunkers are used extensively for batching aggregates, as cement and concrete bins, and for loading road trucks. They are widely used in conjunction with mechanical bucket elevators for handling many types of bulk materials.

Suspension bunkers are frequently used where there are several powerhouse boilers to be fed with coal, and where chutes are employed instead of a weigh larry. These bunk-

(Turn to page 134)

Fig. 1. Locating tunnels, troughs, spouts, etc. to facilitate gravity flow



For Quick Reference—Which System To Use and Where

Tables I, II. Conveyors used for bulk materials are shown in table at top; description of silos and bunkers appears below

TYPE OF FLOW (Volume-Speed-Duration)		SYSTEMS FOR FINELY DIVIDED Or Pulverized Materials		SYSTEMS FOR LUMPY, BROKEN Or Crushed Materials	
Quantity Handled	**Frequency of Flow**	**Bulk Conveyors**	**Other Bulk Devices**	**Bulk Conveyors**	**Other Bulk Devices**
Up to 10 tons per hour	Continuous flow	Belt Vibrating Pneumatic	Solids pumps	Belt Vibrating Flight (scraper)	
	Intermittent flow		Powered trucks Hand trucks		Powered trucks Hand trucks
	Intermittent demand with storage to give continuous-flow effect	Belt Vibrating Pneumatic		Belt Vibrating Flight (scraper)	
	Continuous demand with storage to give intermittent flow		Powered trucks Hand trucks		Powered trucks Hand trucks
From 10 to 100 tons per hour	Continuous flow	Belt Vibrating Pneumatic Flight Screw	Solids pumps	Belt Vibrating Apron and pan Drag-chain	
	Intermittent flow		Powered trucks	Monorails	
	Intermittent demand with storage to give continuous-flow effect	Belt Vibrating Pneumatic Flight Screw	Solids pumps	Belt Vibrating Apron and pan Drag-chain	
	Continuous demand with storage to give intermittent flow		Powered trucks	Monorails	
Over 100 tons per hour	Continuous flow	Belt Pneumatic	Solids pumps	Belt Apron and pan	Solids pumps
	Intermittent flow		Tractor-trailers Industrial railways		Drag-line scrapers Industrial railways
	Intermittent demand with storage to give continuous-flow effect	Belt Pneumatic Flight	Solids pumps	Belt Flight (scraper) Apron and pan Drag-chain	
	Continuous demand with storage to give intermittent flow		Tractor-trailers Industrial railways		Drag-line scrapers Industrial railways

STORAGE STRUCTURES	DESCRIPTION	FEATURES	APPLICATIONS
1. Poured-concrete or monolithic silos	Constructed with sectional ring forms mounted upon each other for pouring. Or made with slip form which is moved up slowly	Cost less than block or hollow-tile silos. When built in rows, can be serviced by belt conveyor along tops and by another under bottoms	Permanent structure for storage of flowable materials, such as grains, coal and ashes, where freezing temperatures present no problem
2. Concrete-block or hollow-tile silos	Precast, chambered, concrete blocks or hollow tile. Sometimes mounted on drive-under support	Air spaces in blocks or tiles retard freezing of material in storage. These cost more than monolithic silos	Permanent structure for storage of flowable materials where freezing weather is occasional but not severe
3. Steel-plate silos	Steel plate with bolted sections	Easily dismounted and shifted from place to place. Subject to corrosion. Poor insulator against freezing	Usually set up as a temporary structure in construction work for storing cement, crushed stone, or gravel
4. Framed outside bunkers or bins	"Inverted pyramid" overhead structure with steel-framed sides and sloping floor. Also called batch hoppers	Nearly self-clearing. Sometimes equipped wtih power-operated gate and automatic scale	Permanent structure for storage of sand, stone, and cement in concreting plants doing large batching work

ers are usually placed inside the boiler house and filled by a horizontal distributing conveyor.

Bunker functions. Bunkers along with silos generally constitute the heart of a bulk-material handling system in a plant. These storage bins are equipped to receive, store, mix and load bulk materials into dump trucks or onto conveyors feeding process operations. Skip hoists, belt conveyors, bucket elevators, vibratory equipment and pneumatic conveyor systems are used for loading and unloading.

A common handling problem encountered in flowing bulk material through silos and bunkers is the tendency of the material to become segregated into fine and coarse particles as it is being loaded into the bin. This tendency is especially pronounced when a conveyor or bucket elevator discharges a single stream of material into the top of a bin which is only partly filled.

Although this tendency cannot be overcome entirely, much can be done to alleviate it. One method is to divide the stream of material entering the bin. This tends to form several piles which cause the coarse and fine material to overlap and thereby intermingle. The division of the material can be made by a swing spout circling the top of the bin.

Another method which is effective when the bottom discharge point of the bin is near the center of the bin is the use of a flat board or steel sheet, either circular or square. The material will build up a cone on top of the board and then run off the sides in a ring instead of down to a point.

Bin partitioning is another method of preventing segregation. Under this plan, the bin is partitioned into small sections measuring three or four feet square. The coarse sizes of material falling into these small sections are first deflected from the top of the pile, and then from the partitions. By this method the material becomes evenly mixed in layers. Retarding ladders in the bin also prevent segregation by sending the material cascading from one step to another down to the pile.

In addition to segregation, other flow problems common to silos and bunkers include arching, rat-hole funneling, and just plain hanging up of the stored bulk material. The tendency of materials to form a compact arch above a silo opening is more prevalent with large crushed pieces than with other particle sizes, but pulverized materials are not far behind in this respect.

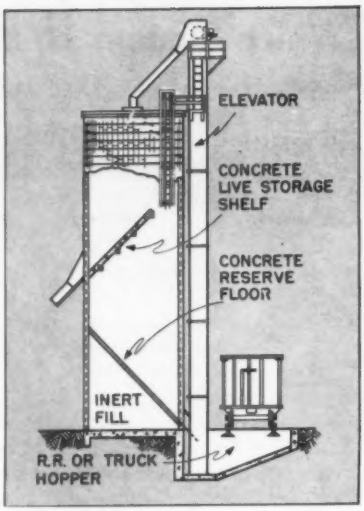


Fig. 2. Typical live-storage shelf and reserve-storage floor in concrete silo.

The latter have the added tendency of forming a tubular passage, or rat-hole funnel, from bin discharge opening clear up to the top of the silo contents while being released from the silo.

Facilitating Gravity Flow

Representative methods of gravity discharge at silo openings are illustrated in Fig. 1. A common fault of many bin designs is the limited provision of one small opening at the bottom. Two or more openings along the bottom have proved to be more satisfactory, and are sometimes even sufficient to break any arches which form at discharge points.

To facilitate flow from a bin, it is suggested that openings should be long rather than round or square; and that openings for difficult materials should be in the side of the bin instead of the bottom. This is strongly emphasized.

The storage of bulk materials in silos introduces problems in handling, however, which rarely occur in storing the same materials in single conical piles on open ground. Materials which become sticky when wet, or semi-frozen in cold climates, are frequently difficult to discharge from the bins. To relieve these conditions, material-loosening devices are sometimes necessary. These include:

1. Vibrators installed on chutes under silos. These work on the same principle as a car shaker.
2. Mechanical plungers operated inside the bin hoppers.
3. Suspended chains manipulated into the bin hoppers to loosen the compacted material.
4. Propeller arm operating inside the bin by chain-driven teeth as on a chain saw.

Storage tanks. The varied applications of storage tanks today in industries other than petroleum are virtually endless in scope.

Liquid storage tanks are for storing pulverized bulk solid materials. When used for the storage of light granular material such as grain, these tanks are usually vertical in shape and provided with cone bottoms within the tanks to assure gravity flow. The tanks may be filled by overhead feed conveyors, and emptied by a similar underground system. The simplest form of storage tank is a plain metallic horizontal cylinder resting or cradled on the ground, with underground facilities for recovering the material from the tank. A more conventional storage arrangement, however, is to mount the tanks above floor level where they can serve the double purpose of storing and feeding.

Many of the finer grades of bulk solid materials are conveyed into and out of liquid storage tanks by air-flow pumping systems.

Since aerated material flows freely, it is sometimes advantageous to add air to the material while it is in the bin.

In view of the physical limitations inherent in both bin storage and stockpiling, however, the question arises as to where to find the economic break-even point between the two systems.

The handling of a specific material for a given storage volume and consumption rate will often readily justify the stockpile system over the silo system. On the other hand, a different material with like volume and activity will definitely show economic advantages in the silo system over the stockpile. Each method should, therefore, be fully analyzed and weighed from the standpoint of the physical characteristics of the bulk materials being handled. **End**

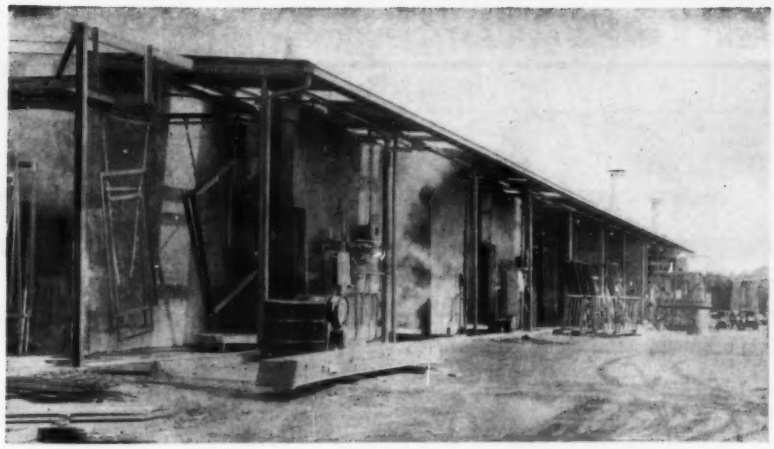


Fig. 1. General view of outdoor metal treating and painting facility. Extension of the plant roof provides the only "cover" necessary in mild California climate.

PAINT BOOTH IS MOVED OUTDOORS

Air Pollution and Fire Hazard Isolated

ONE OF THE interesting features of the new plant of Arcadia Metal Products, Fullerton, California, is the 200-ft long outdoor metal cleaning, treating and painting facility. It parallels one wall of the plant. See Fig. 1.

The company produces aluminum, steel and stainless steel frames for glazed sliding doors, windows and windowall construction. Although this painting facility was installed at the time the plant was built, such an arrangement could be incorporated in almost any plant where sufficient external wall space is available.

Basically, the Arcadia arrangement has several advantages. It saves floor space that would otherwise be occupied by cleaning tanks, phosphatizing equipment, paint booths and baking ovens. It removes from the main plant a serious source of air pollution and, at the same time, minimizes plant air conditioning requirements. It also places a constant and serious fire hazard, namely the paint booth, beyond the plant wall.

Various compartments of the cleaning, painting facility are entirely separated from the main building, with about two feet of space intervening. Since the outside installation was made at the time the plant was built, the steel roof beams of the plant extend out and over the facility, providing cover and support for the structure and the conveyor.

The conveyor for the paint line travels in a long loop around one entire section of the plant wall. This loop is over 200 ft in length. As the conveyor travels outside the building, the parts go through a cleaning and phosphatizing solution. Pressure spray nozzles are used for applying the solutions. After cleaning, the parts pass through a warm air dryer and then to the paint booth.

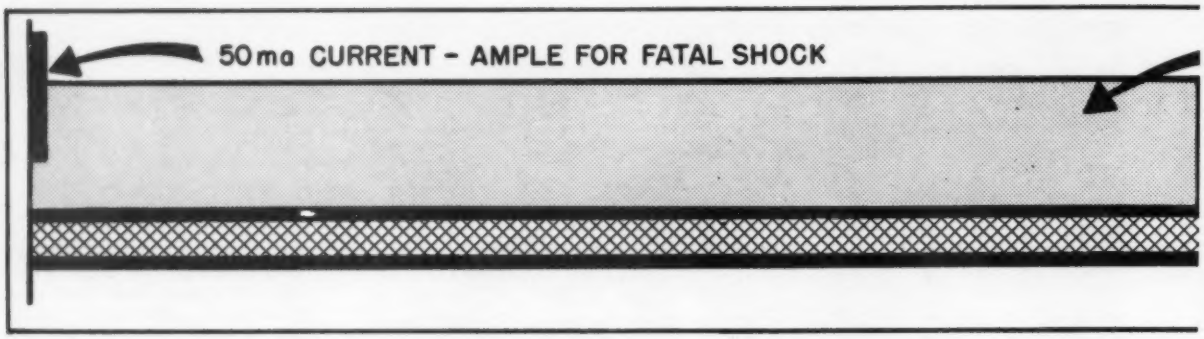
Flow-coating is used for applying the paint. A 120-gallon paint reservoir is located beneath the paint booth. Pumps force the circulating paint through the flow-coater nozzles. Surplus paint is gravity-drained back into the reservoir.

Very close quality control is maintained over this phase of the operation. The paint is not only carefully mixed and its viscosity adjusted before it is placed in the reservoir, but hourly viscosity checks are run on the paint in the reservoir to assure uniformity.

After being painted, the parts enter a 60-ft long baking oven where the coating is baked at 320 F. Heat for this oven is supplied by electrically controlled, forced air natural gas burners mounted high on one side of the oven structure. The conveyed parts then move inside the plant and parallel a final assembly and inspection section. They are unloaded from the paint line conveyor and placed on a floor-mounted roller conveyor which makes both inspection and final handling very easy. Beyond this point, the frames are ready for shipping. **End**

Fig. 2. Here, at the exit end, the conveyor carries frames back into building.

Fig. 3. Burner blower provides bake oven with 320 F heat for drying coating.



Current needed to produce a fatal shock is around 50 milliamperes or 0.50 ampere. Bar graph illustrates the relation-

WHEN IS ELECTRIC SHOCK FATAL?

Six Factors Determine Degree of Hazard

By A. L. DOWDEN, Electrical Engineer, Liberty Mutual Insurance Company

IT HAS BEEN SAID that there are only three ways in which one can get an electric shock. The first is to place some part of your person in series with the voltage. This can occur when connecting a wire to a fuse block. If you hold the wire in one hand and accidentally touch the fuse block with the other hand you may get a shock. This may be due to a voltage backfeed through the device connected to the wire. Accidents of this nature are quite rare and happen only five times out of a hundred.

Contact from voltage to voltage is another way of receiving an electrical shock. One can get into this situation in two different ways. You can get across voltages of different magnitudes as between a 2300-v system and one operating at 220 volts. Current will flow because of the difference in voltage.

Another way and probably the most common method of getting across two voltages is to get across two different phases. This happens quite frequently in plant electrical distribution work. The voltages are of the same magnitude but because of the difference in phase relationship, a current will flow through anyone making contact. Contacts of this type account for some 15 per cent of all electrical shock accidents.

Leading by a wide margin, contacts between a voltage and a grounded object account for approximately 80 per cent of all electrical shock accidents. One of the main reasons for this is that a workman is usually well grounded regardless of where he happens to be working.

How serious an accidental electrical shock may be depends upon a number of factors. The first of these is the type of current involved. Generally speaking, this is limited to alternating current and direct current. The principal effect of direct current is that it will give a very serious burn. It is the resultant heat produced that causes the injury. This heat can cause the blood cells to expand and explode, causing death from internal hemorrhages rather than from the visible burns or other injury.

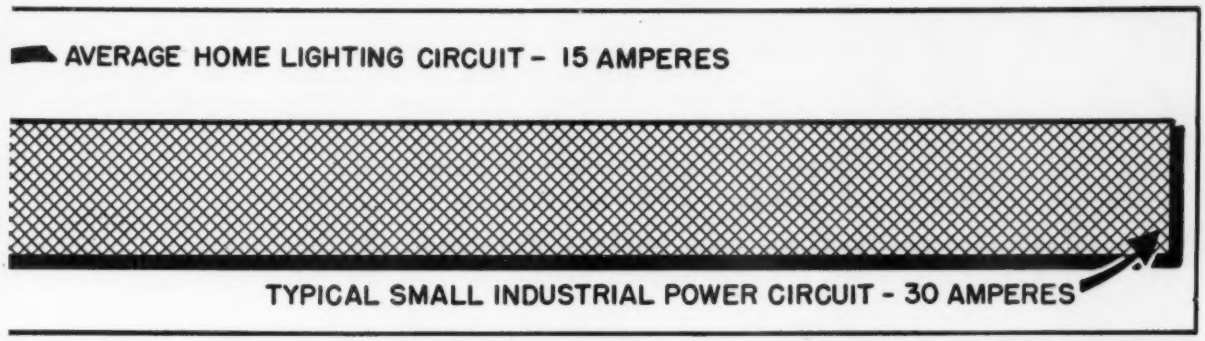
Most industrial plants widely use alternating current and exposure to this current has several other effects in addition to burns. Arcs from either direct or alternating current produce external burns. Passage of current through the interior tissues of the body will also cause burns. In addition, alternating current causes paralyzing of muscular tissue, particularly if it is of low frequency and voltage.

If the current passes through the nerve center, it destroys its ability to send impulses to the nerves. These include the two phrenic nerves that come down the neck, pass through the trunk and attach to the diaphragm. The result is that the victim is unable to breathe. Technically, the victim dies of suffocation. Artificial respiration will keep the victim breathing until the paralysis has been reduced and he is able again to pick up his own breathing.

Another factor that determines the seriousness of shock to some extent is the path that the current takes. Paths that involve the heart and lungs and the phrenic nerve regions are apt to be quite serious. Generally speaking, paths of current through the extremities, like the hand to the elbow, or from one foot to the other, are not apt to be fatal.

Duration of current flow is another factor that determines whether the electric shock will be serious or minor. The longer the current flows, the worse the effects will be. Some shocks have been fatal that involved only a fraction of a second. On the other hand, persons have been in contact with live wires for several minutes without serious results.

The amount of current that flows during an accidental contact is another factor that determines the seriousness of the shock. In several accidents, the mysterious thing to the investigators has been that the fuses were not blown. How can the man have been electrocuted with



ship between this small value and the amount of current normally available on home lighting and industrial power circuits.

the fuses being intact? There was no interruption in the power and the plant operating personnel did not even know that a workman had made contact in the electrical system. It is a fallacy to expect the fuses to blow because the amount of current required to produce fatal results is generally quite low.

Let us suppose that we have a controlled circuit arranged so that when a person makes contact with the two terminals, one milliampere of current flows. As there are 1000 milliamperes in just one ampere, we can see that this is a very small amount of current.

Human sensitivity is great enough, in general, to feel even this minute amount of current. If the amperage ranges from one to eight ma a person receives a definite sensation of shock. At this low value, muscular control is not lost and you can let go at any time.

When the current value is increased to 15 ma a definite sensation of pain is experienced at the point of contact. You can feel heat being generated and a piercing sensation, much like that of a needle, is felt. The pain is continuous but at values of this low magnitude you can still let go at any time.

When a current value of 15 to 20 ma is reached, the shock becomes very painful and we have passed the threshold of let-go current. In this range, the average person cannot voluntarily let go of the wire as he is beginning to suffer muscular paralysis.

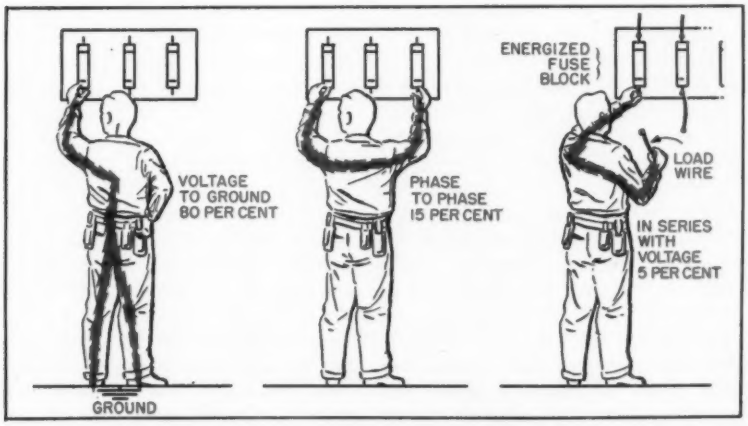
Above this value of 20 ma is probably the range of current involved in most fatalities. Anything below 20 ma produces nothing more than minor shock in the majority of cases. From 20 to 50 ma one gets very severe muscular contractions and very painful shocks. The tendency is to contract the muscles and grab the terminals harder. Breathing becomes very difficult because you have to breathe against the contraction.

In the range of 100 to 200 ma the values of current will produce ventricular fibrillation or fibrillation of the heart. Over 200 ma causes some of the severe burns that are usually associated with electric shock even though they may not be fatal.

A very important factor involved in electric shock is the resistance of the contact. It is perhaps the most variable in the groups as it varies because of the area that is in contact. The larger the area, the lower the resistance and low resistance allows more current to flow as current flow varies inversely to the resistance.

Moisture is a prime factor in determining the resistance of a contact with an electrical circuit. Many electric shocks have contacts under the arms, involving the feet and other parts of the body that might be moist. The peak of the fatal shocks every year takes place during the summer months of May, June, July, August and September. At that time of the year, starting at the southern extremity of the country and going right up into Wisconsin, there will be a peak of electrical accidents. This reflects the part perspiration plays in causing electric shocks.

Everyone talks about voltage as being the major factor in electrical shock accidents. Generally speaking, this is true and the higher the voltage the worse the shock. However, if there is enough voltage to overcome contact resistance so that an amount of current will flow long enough through a vital path, the victim will be killed even though this voltage may be relatively low. The only difference between a minor shock and a fatal one is in the way all of these factors interact. **End.**


VOLTAGE TO GROUND 80 PER CENT
PHASE TO PHASE 15 PER CENT
ENERGIZED FUSE BLOCK
LOAD WIRE
IN SERIES WITH VOLTAGE 5 PER CENT
GROUND

All cases of contact with electric systems can be traced to one of three causes.

TWO-WAY FIRE PROTECTION—
Sprinklers Join Forces With Alarm System

By HYMAN SCHEINBEIM, Chief Plant Engineer, Burndy Corporation

F I-R-E can spell "trouble" to plant engineers!

Right now, industrial fire losses are running into the hundreds of millions of dollars per year. Question is, what can plant engineers do to prevent their company from becoming part of this year's statistics?

Thousands of plants have installed low-cost automatic fire alarm systems to provide immediate detection, location and warning of fire. On the other hand, sprinklers, whose fire fighting advantages are obvious, form the bulwark of protection systems in many other plants.

But according to fire experts, the combination of a fire warning system and sprinklers provides the most complete protection available today. This type of arrangement will not only warn of fire—24 hours a day, every day in the year—but will extinguish a blaze as well.

We have just such a combination at our Norwalk, Conn., headquarters. In fact, our own maintenance department installed the comprehensive automatic fire alarm system and tied it on the company's existing sprinkler network.

Development of Burndy's system resulted from a careful two-part study—part one was devoted to a general survey of industrial fires, part two was evaluation of the fire protection equipment.

The survey revealed a number of unusual facts. Chief among them was that virtually every large-loss industrial fire could have been controlled, or prevented altogether, if it had been detected early enough. Of 505 fires which caused damage of $100,000 or more, extensive destruction in 428 of them (fully 85 per cent) was due to delayed discovery or watchman failure. Obviously, early detection of these blazes would have given fire fighters an advantage of precious minutes, which might have resulted in savings of millions of dollars.

A Burndy engineer tests the finished fire alarm system. The system will detect fires automatically as well as manually and operates on a 24-volt current. Standby batteries for the alarm system are located behind cinder-block wall.

Part two of the study, evaluation of fire protection systems, pointed up our need for an automatic device that would protect unsprinkled areas. Besides covering these, the alarm would also work hand-in-hand with the sprinklers. Additionally, the engineers concluded, the fire alarm system would notify municipal fire headquarters.

Once the need for an automatic fire alarm system was established, our plant engineers outlined the situations which an efficient system would be expected to take in stride. For one, it would have to be capable of protecting a number of buildings covering a reasonably large area—since our company headquarters consists of six structures spread over some 11 acres.

For another, the varying nature of the buildings to be protected—a warehouse, plant buildings, two office structures and a library of precious manuscripts and early electrical machines—required that the system be made up of both automatic and manual fire detection stations. For example, because of the low level of traffic in the Burndy library—one of the finest on early science and technology in the nation—automatic detection was mandatory. (Incidentally, the library building could not be sprinkled be-

cause of the danger of accidental water damage to its irreplaceable contents.) On the other hand, normal pullboxes would be more than adequate for corridors of office buildings since they were well-traveled most of the day.

To insure conformity to standards of good practice, we followed National Board of Fire Underwriters recommendations. As regards power supply, this meant not only would the system be electrically supervised, but would have a reliable secondary power source as well. Should a fault occur in the system's wiring or components, a trouble bell rings to alert maintenance personnel. The secondary power source has another function: it takes over, automatically, in the event of either power failure or interruption. When normal power comes back on, the secondary source is removed from the line—also automatically.

Once the specifications were detailed, Burndy contacted the Edwards Company, Inc., who manufacture electrical fire alarm systems. One particular fire alarm system, AMVAD (Automatic-Manual-Vibrating bell-Ac-Dc), seemed to fit our needs perfectly.

Basically, this system detects a fire and locates it according to preestablished zones—as many as required. When the fire is detected, anywhere, the system immediately sounds a general evacuation alarm, indicates the fire zone, and, via a pair of leased telephone lines, sends a signal to municipal fire headquarters. A switch on the control panel allows for periodic testing of the system without sending an alarm to fire headquarters. The system operates on low voltage and, therefore, requires no conduit or pipe.

Two types of automatic detectors are used in the system. One is set for a fixed temperature, either 135 or 200 F, depending upon the particular area being guarded. The second combines a rate-of-rise feature with fixed temperature. These are rated at 136 and 190.

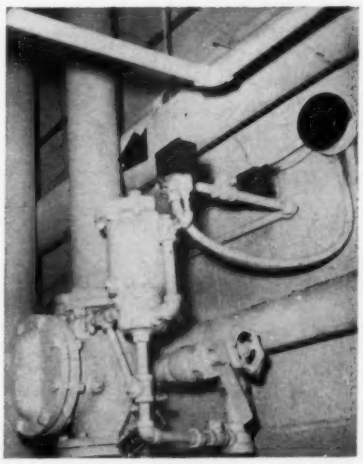
In the normally well-trafficked areas, manual pullboxes of the "break glass, pull down" variety are used.

Following schematic wiring diagrams furnished by Edwards, our engineers installed the entire network. Fire stations were wired in two separate zones, one corresponding to the library and the second to the warehouse and two office buildings. Zones were composed of both automatic and manual fire stations. The two districts were then connected to associated signal lamps on a control panel located in the executive office building.

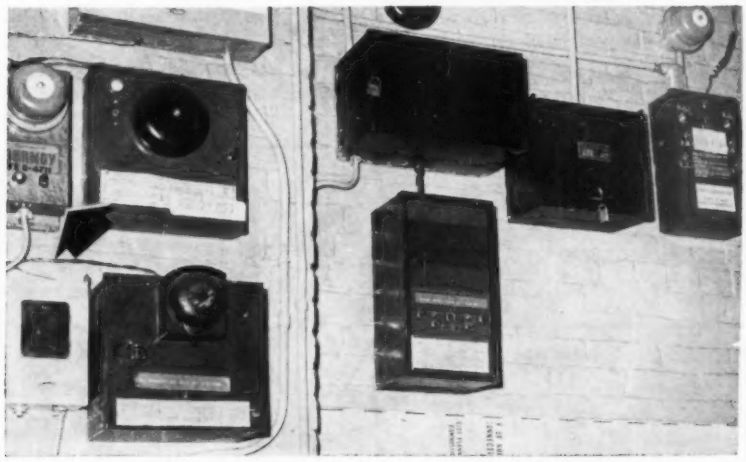
To integrate sprinklers into the system, all that had to be done was install flow switches in the main sprinkler valves of each of the four remaining buildings. These were wired into the system just as the detectors were. The switches are normally in open position. If a sprinkler should be set off by fire,

(Continued on page 244)

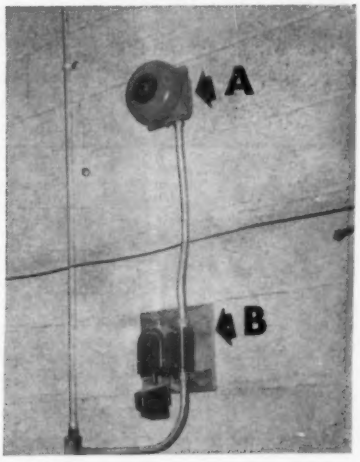
One of the many rate-of-rise detectors (arrow) located throughout the plant.



Automatic flow switch on sprinkler valve (arrow) also warns of trouble.



View of control panel in Norwalk, Connecticut, fire station for a number of industrial plants in area. Burndy unit (arrow) is in the upper left hand corner.



Bell (A) sounds when system detects fire; bell (B) sounds if wiring is faulty.

Needed: ONE DYNAMIC BALANCER Plant Engineering Project: BUILD IT!

By R. A. BUTLER, Plant Engineer, Titusville Division, Struthers Wells Corporation

MOST OF THE forged steel products manufactured by our company are used in high-speed rotating service. These products, which include crankshafts, engraving rolls, tail shafts, drive shafts and propeller shafts, require that unbalance be within extremely narrow limits. The vibrations produced by rotating parts which are not closely balanced can cause noisy operation of the mechanism, be harmful to bearings, may cause outright failure or destruction of a mechanism and directly affect a machine's efficiency.

Fig. 1. A-frame structure with bearing in hanger. Other stand is identical.

Therefore, to precision balance forgings that may vary from 100 lb to 30,000 lb, the plant engineering department designed and built a device which will accept units up to 50 ft in length and requiring up to 6 ft in swing. Many pieces to be balanced are irregular in shape. Since balancing speeds also vary, the machine was designed to rotate work at any speed up to 1000 rpm. Workpieces are usually balanced at what will be their normal operating speed range, when assembled.

The two-plane balancing machine consists of a mechanical and electronic system. The mechanical portion contains the drive mechanism and the means for workpiece suspension. To suspend the work, two movable A-frame structures were designed and built—each supports a bearing cradle through a dual-hinged linkage. This flexible suspension permits an unbalanced workpiece to reveal the dimensional differences between its designed axis of rotation and its true weight axis, when rotated on its main bearings.

The bearing cradles are designed to accommodate either half plain bearings or "O" zero-precision antifriction ball or roller bearings, the choice of which depends on the weight, size and balance tolerances of the work to be balanced. When antifriction bearings are used, they are zero-precision, so as to have no inherent runout and no wear, since either condition would give a vibratory motion to the workpiece. When half sleeve plain bearings are used they are precision-made to support the work—as they would be in the ultimate machine assembly. This is also true of adapters that might be used between the workpiece bearing and the bearing used for balancing; adapters are finish machined and static balanced before use.

The A-frame suspension structures are set on level machined and tee-slotted surface plates, which are imbedded in a thick slab of concrete. This not only facilitates setting up work on the machine, but isolates the equipment from any extraneous sources of vibration.

After hanging the work in the frames, the bearing cradles and the work are leveled by adjusting nuts on the supporting linkage.

A variable-speed d-c motor, rheostat-controlled, provides the power to rotate the work. V-belts transmit power in a 1-to-1 speed ratio from the motor pulley to a jackshaft pulley on a belt takeup unit, Fig. 3. On the opposite end of the jackshaft is a flat belt pulley through which power is transmitted to the workpiece.

This flat canvas belt is always positioned to drive the work at its

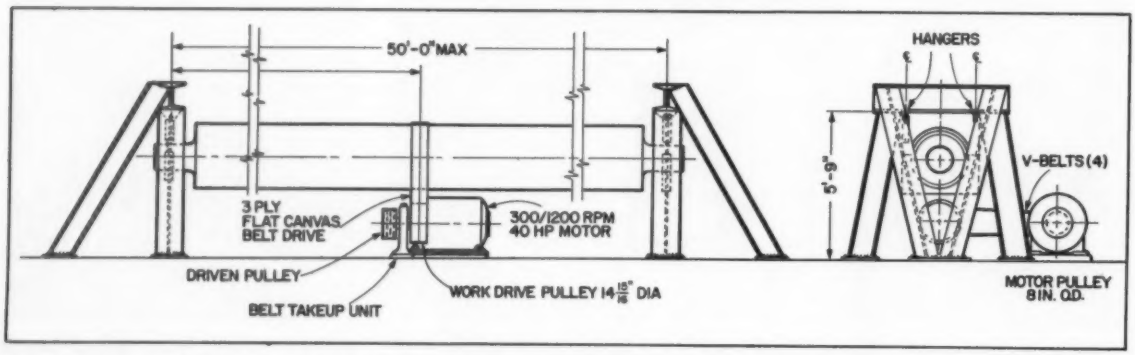
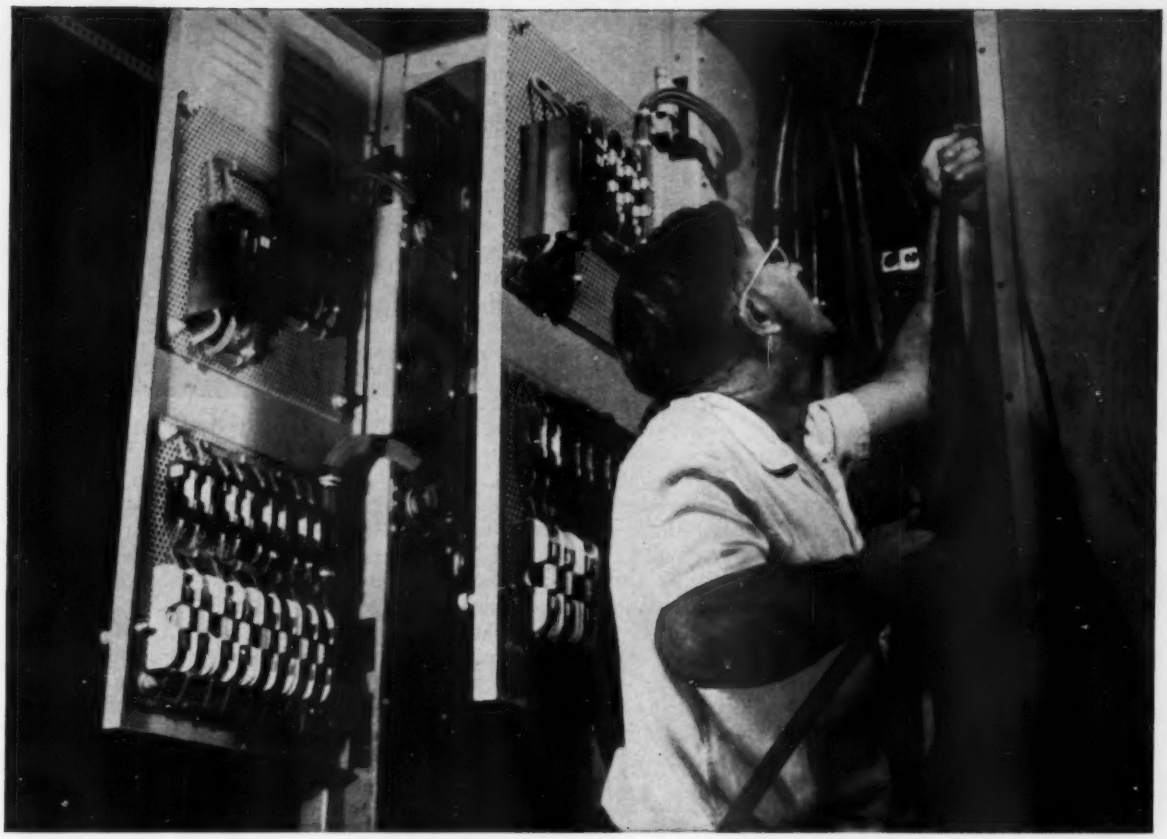


Fig. 2. Drawing of balancer with shaft in place. Drive is at center of gravity, and directly under centerline of shaft.



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Insulation: Sure and dependable terminations are possible because Rolene strips cleanly. This smooth, positive-stripping polyethylene lets you consistently make an efficient installation.

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calculated horizontal center of gravity and in order to minimize any effect on the desired work gyration, the flat belt drive is positioned in a vertical plane directly beneath the workpiece.

The electronic portion of the balancing machine consists of an in-place balancing instrument of the type produced by International Research & Development Co., or Tinius-Olsen.

Pickups or transducers, attached to the two main bearing cradles, react to the runout or unbalance of the workpiece. They are seismographic and self-generate an output proportional to their motion's velocity. Their output is directed to indicators—through filters that dissipate any unwanted signals in order to discriminate against the effects of all other rotational speeds.

These filtered signals from the pickups indicate, on meters, the relative magnitude of unbalance and its frequency in cycles per minute.

In conjunction with these, it is necessary to determine the angular location of the unbalance. This information is determined by the use of a stroboscopic light, beamed on the end of the part. This light is triggered by the unbalance and will show the relative phase angle of the unbalance.

Subsequently, pieces of putty or lead weight are banded in a systematic manner to the periphery of the workpiece at the angular location previously determined, and when balance is obtained at the desired speed, as indicated by the strobe light's inability to "freeze" the reference mark, the corrective pieces are weighed. With the angular displacement and amount of unbalance known to an acceptable degree, corrective measures may be taken, 180 deg away from the corrective weights.

To verify the accuracy and performance of the dynamic balancing machine, a previously-balanced 2700-lb test rotor was unbalanced by a measured amount. Calculating the residual unbalance in the balanced workpiece after reading the change in instrument indications caused by the measured unbalance, extrapolations showed it to be better than 8.5 oz-in. The specifications allowed unbalance of 666 oz-in. at 150 rpm to 15 oz-in. at 1000 rpm.

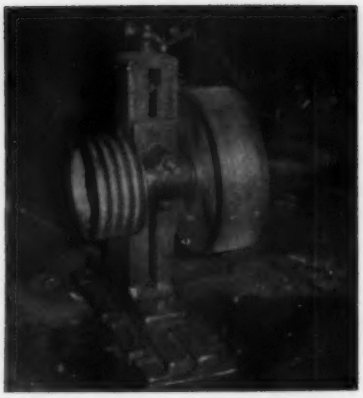

Fig. 3. V-belt pulley of jackshaft is driven; flat belt turns the workpiece.

Having balanced the shaft to better than 8.5 oz-in., the machine was certified to be well within tolerances over the entire speed range. **End.**

"Moving Mask" Cuts Painting Time

SPRAY PAINTING of metal unions, masked by an ingenious use of kraft paper tape, has replaced a manual painting process that formerly limited production at the Well Equipment Manufacturing Co., Houston. The body of the metal unions produced by the firm must be painted, but the seat must be kept clear of paint. It was this necessity for control that limited production of a four-girl crew, using hand spray guns, to 100 units per hour.

To provide a simpler and faster means of painting the unions, and at the same time protect the seats from paint spray, company engineers devised and installed an automatic spray painting jig.

Basis of the jig is a small platform, on the opposite ends of which were set two shafts—one driven. A roll of 500 ft of two-inch-wide kraft paper feeds from the spool on one shaft across the platform to the takeup spool on the driven shaft. As it feeds, it runs between the conveyor line carrying the unions to be sprayed and the pair of spray guns mounted to do the spraying.

The tape serves as an effective mask for the seat of each union, without actually touching it—thus eliminating any need for applying masking to the individual units. Buildup of paint on the tape is prevented by the movement of the tape across the platform—as it is coated by overspray from the guns, it is moved out of the spray area and rewound on the takeup spool, for disposal.

The four-girl crew that was formerly needed to paint 100 units per hour has been cut to a crew of three girls, whose combined production rate averages between 700 and 800 units per hour. They load the conveyor, thread the spools when a roll of paper has been exhausted, remove the painted unions from the conveyor and inspect them. **End.**

Fig. 1. Masking tape winds on takeup reel (left) after moving past spray.

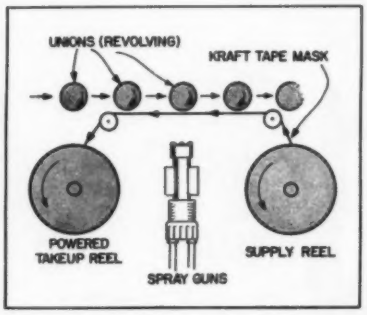

Fig. 2. Layout sketch shows countermovement of tape and unions in jig.

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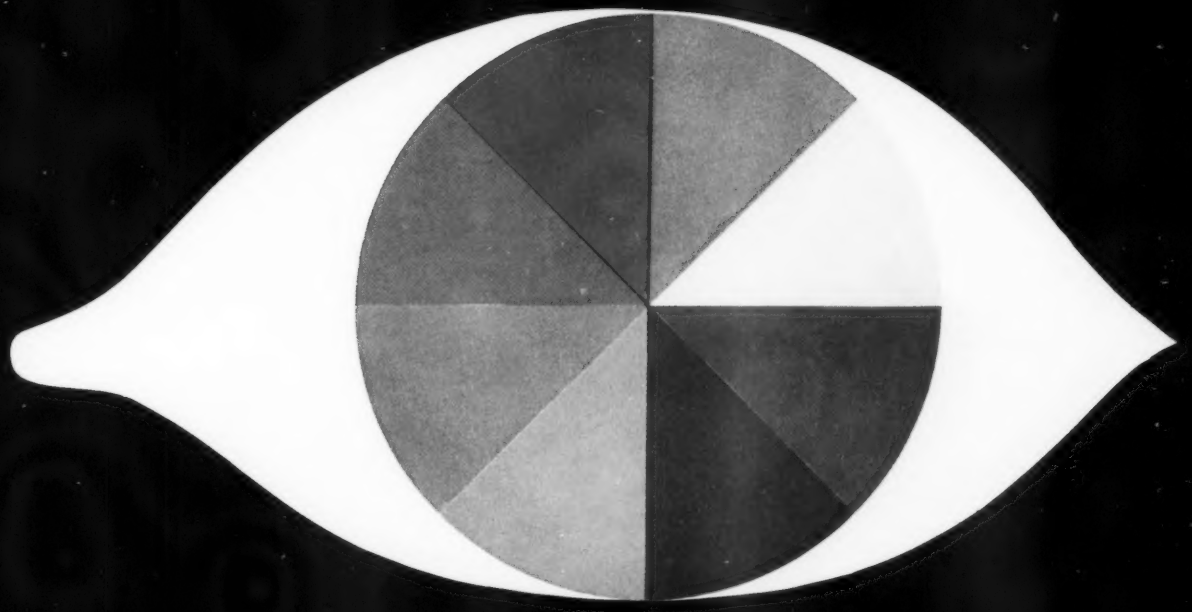

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DU PONT COLOR CONDITIONING PAINTS

NEW OFFICES— FROM AVAILABLE PLANT SPACE

By W. A. WEIBEL, Illuminating Engineer,
Curtis Lighting, Inc., Chicago, Ill.

Fig. 1. This is how offices shown below started out in life.

Figs. 2 and 3, below, show transverse and lengthwise views of finished combination lighting and acoustical installation.

IF MORE OFFICE space is required for your plant operations, a new building may not be the only answer. Ground space, location, costs and the fact that there may be space available in present buildings, may all be valid reasons for not erecting a new building.

Modern office planning recognizes that office personnel (and office machines!) require certain considerations as regards the lighting, heating, cooling, ventilation, etc. of the office area. These considerations may be applied to available space in converting it to office use just as readily as to space enclosed by a new building.

In January, 1955 office employees of General Mills, Inc., Chicago, Ill., were enjoying their new office—only recently converted from storage space. A few weeks previous, much of the area had been piled with sacks of grain and the existing office space was inadequate in many respects. The General Mills engineer, B. H. Blevins, working in cooperation with representatives of the electrical contractor and the manufacturer of lighting equipment, had planned and supervised the changes.

The available space was a functional enclosure of poured concrete ceiling and floors, concrete-enclosed vertical steel column members, and brick walls. Ceiling areas were cluttered with piping, hung with cords and cables. The lighting system consisted of drop cords and a few fluorescent two-lamp luminaires. The problem was complicated by vertical pipes passing through the area.

Major elements of the area were left largely "as was" and exposed piping systems on the ceiling were masked by vertical panels of the new lighting system. These panels, of acoustical material, masked the piping and shielded the eye from direct view of the fluorescent lamps through all but the very high viewing angles. The panels also contributed a very satisfactory reduction in noise level in the area.

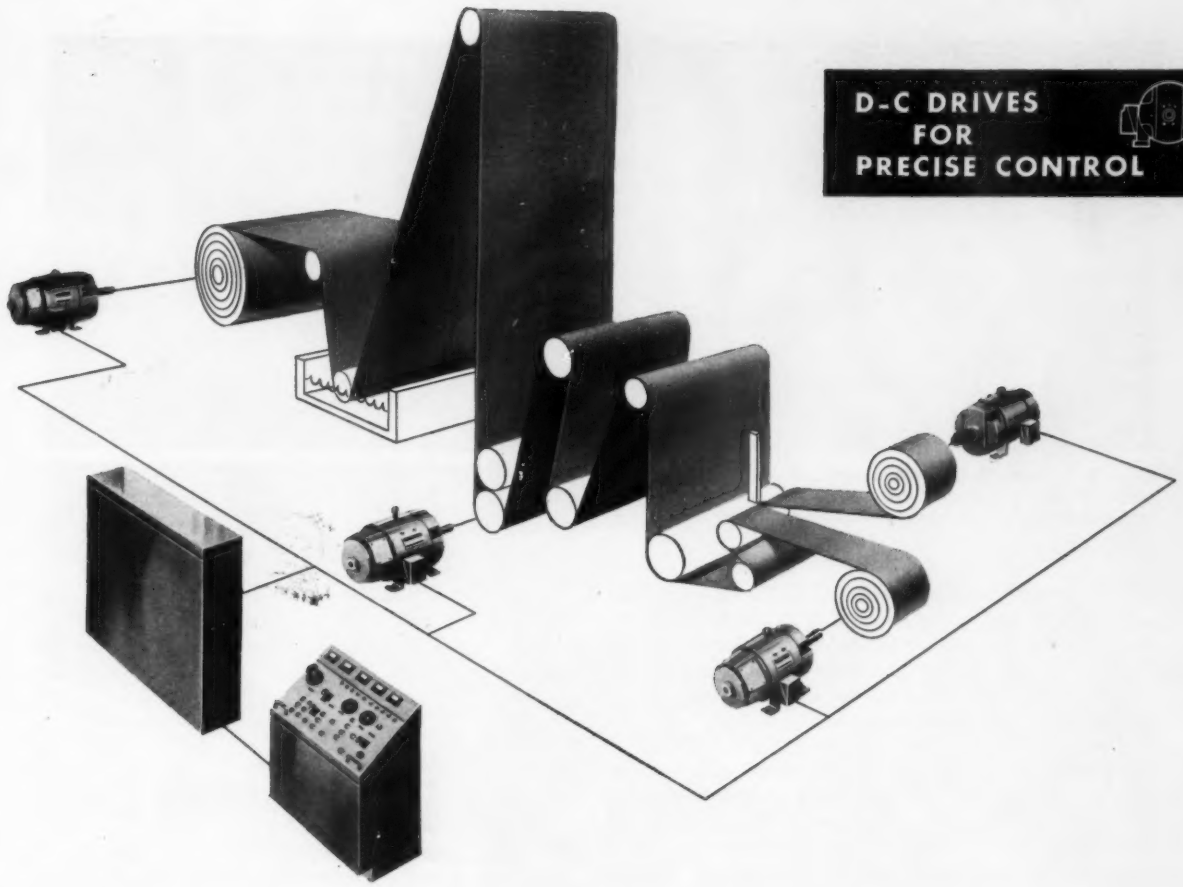
The 7000 sq ft of office area with modern treatment of wall, ceiling and floor surfaces; with new desks, chairs and filing cabinets, steel partitions, new window treatment and adequate light and sound conditioning, is an amazing transformation.

Maintenance of the space has been greatly simplified due to the treatment of all surfaces and also to the unusual method of providing both light and sound conditioning with a single system.

The Garlock Packing Company of Palmyra, N. Y. in 1957 converted available plant space to office space. Representatives of Garlock visited the General Mills installation. Their problem and solution were very similar—only larger. The Garlock conversion consists of two floors totalling approximately 21,700 sq ft.

The Palmyra building was 47 ft wide and the upper floor featured monitor type construction. The windows

D-C DRIVES FOR PRECISE CONTROL



Problem: How to control sheet or web tensions for faster machine operation, better quality

Tension inaccuracies during high speed production can result in torn sheet, costly production snarls, poor product quality. To control sheet or web tensions accurately, speeds of machines must be closely synchronized. Equipment must be brought up to top speed gradually—smoothly—without loss of tension. Often a dozen motors must respond as one—instantly. **Direct-current drives can best meet this need.**

In continuous processing—wherever accurate control is needed—direct-current adjustable-speed drives perform with instantaneous tension adjustment—smoothly, automatically. The result: faster machine operation, better quality, lower production cost.

This is only one example of d-c's modern capabilities. Throughout industry there is a growing trend to more direct-current powered equipment. The reasons for this trend are explained in a new General Electric booklet called "WHY D-C?" For your free copy, write *Department 829-1, General Electric Co., Schenectady 5, New York.*

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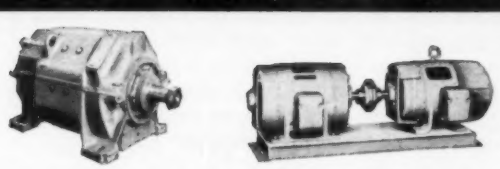
SELECT FROM G.E.'S COMPLETE LINE OF D-C DRIVES



MOTORS AND GENERATORS

POWER UNITS AND CONTROLS

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Figs. 4, 5, 6 and 7, above and right, illustrate the various stages in the two-floor conversion from unoccupied plant area shown to well-lighted, pleasant-appearing office space.

of the monitor were closed with solid vertical panels, vertical I beams were stripped and all surfaces refinished. The floors were treated to a new covering of asphalt tile and window sash were refinished. A freight elevator was removed from its shaft and this space utilized for air-conditioning equipment.

The big change in the area was the installation of the combination light and sound conditioning system. The sloping ceilings, the monitor, the exposed piping, the ducts of the new air conditioning and the new fluorescent lamps themselves all disappeared from normal view when the vertical, acoustic panels were installed.

System Is Simple To Maintain

The 100 ft-c of illumination is a major contributor to office efficiency. The drafting tables, business machines, desk tops, files and aisle space are equal beneficiaries. The shadowless, abundant illumination has been well received by management and all office personnel—draftsmen in particular! The maintenance foreman was one of the most pleased as the new system will be simple to maintain, the tops of the fluorescent lamps being the only horizontal surfaces which collect dust.

The vertical, 12-in. acoustical panels extend virtually the full width of the building. Both vertical surfaces are of perforated, non-metallic, sound absorbing material. These panels are on 24-in. centers and each lineal foot of panel thus represents two square feet of sound-absorbing surface.

The light and sound system is suspended from the building ceiling by means of rods. These rods, in the areas of sloping ceilings, are of varying length but all terminate at the same level above the floor. At this level the rods support long lines of kindorf, structural metal channels. After these channels were levelled, the lighting grids were installed. These grids, factory assembled, wired and folded for shipment, were expanded on the job to form "ladders" of light. The slimline fluorescent lamps became the rungs of this ladder and are supported by lampholders mounted on channels which also contained the ballast equipment required by the lamps. The 96-in. long lamps account for approximately 90 per cent of those used, but 72-in. and 48-in. lengths were also utilized.

The ballast channels also support the lines of acoustic panels. The panels are centered between the lamps and both panels and lamps are 24-in. on centers, providing no less than 45 deg shielding lamps.

These features of lighting, air conditioning, sound conditioning, modern office equipment, etc. can of course be applied to a completely new office building. These installations show how, with some ingenuity and planning, they can be applied to an existing building.

Need more office space in your plant? **End**

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Large or small, BullDog Clampmatic® Vacu-Break® Safety Switches provide *maximum* protection . . . meet your every switching need. You get added safety because of these two exclusives: The unique Clampmatic spring increases the pressure against contact jaws . . . assures clamp-tight connections . . . faster break . . . *really safe operation.* Vacu-Break action snuffs arcs immediately . . . reduces pitting and burning of contacts for long, trouble-free switch life.

BullDog's "Big Three" safety switches, the "Master", "Junior" and "Raintight", assure positive switching . . . virtually eliminate costly maintenance. Get this extra safety, extra performance now. Specify BullDog Vacu-Break Safety Switches.

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Radiation Hazards Overcome With Remotely-Controlled Television

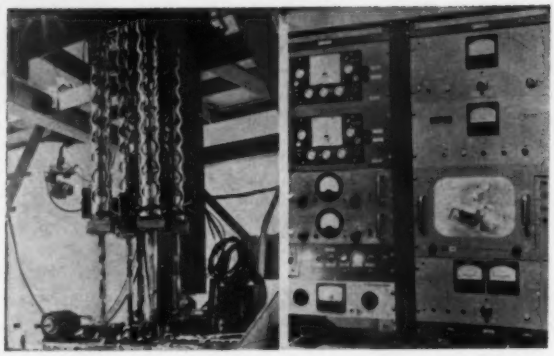
REMOTELY-CONTROLLED closed-circuit television is providing General Atomic Division of General Dynamics Corp. with an impervious eye. The TV camera is located close to a high-powered linear electron accelerator installed in an underground bunker.

The accelerator uses microwave radiation to speed up electrons until they are traveling at close to the speed of light. When these hit the target under test, atomic particles and x-rays scatter in all directions. Radiation levels within a few feet of the accelerator target measure 10,000 Roentgen per hour; safe limit for humans is 0.3 Roentgen per week.

To focus the electron beam, operators stand behind a massive lead and concrete wall, and observe the operation through a high-resolution TV system built by the Kin Tel Div., Cohu Electronics.

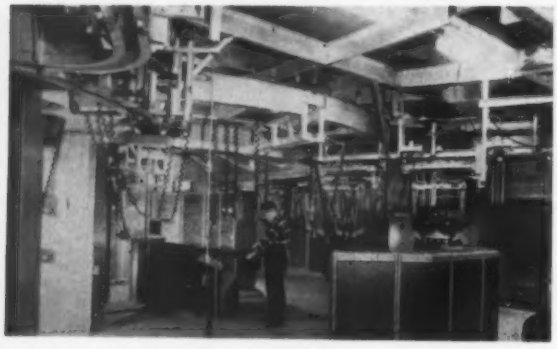
The TV camera can withstand the atomic radiations within the accelerator room almost indefinitely. Its only vulnerable element, the lens, can be cheaply and effectively shielded with a sheet of window glass.

The same camera and monitor system is also used to observe instruments mounted in the target area, and to keep track of the equipment during test. Remote controls at the monitor screen allow the experimenters to tilt the camera up or down, pan it from side to side, focus the lens and adjust the iris to changing light conditions.



Carousel Test Stand Automatically Tests Transformers "On the Run"

USE OF HIGHLY MECHANIZED production and materials handling equipment makes possible the economic, efficient production of transformers at Westinghouse Electric Corporation's new plant at Athens, Georgia. Almost five miles of various kinds of materials handling devices are used: tow lines, monoveyors, and conveyors.



After assembly operations on the pole-type transformers are complete, the transformers are sent to the "carousel" test line for electrical testing. This line is a unique facility that automatically electrically inspects the distribution transformers. The line performs a series of nine standard commercial tests on each transformer, evaluates and records the results of these tests, and accepts or rejects each unit.

The operator need only attach test leads to each transformer as it enters the carousel line. Tests are programmed automatically from punched cards. When the unit completes the last test, the results are recorded automatically, punched into the same cards that programmed the tests. Testing of a transformer is completed every 90 seconds.

Over-all programming and sequencing for the test line is controlled by Westinghouse Cypak static controls, with some relays used to control simpler operations at several stations.

Materials handling portion of the system consists of a 30-ft-diameter rotating wheel, with fourteen loading stations, that transports transformers through the test line.

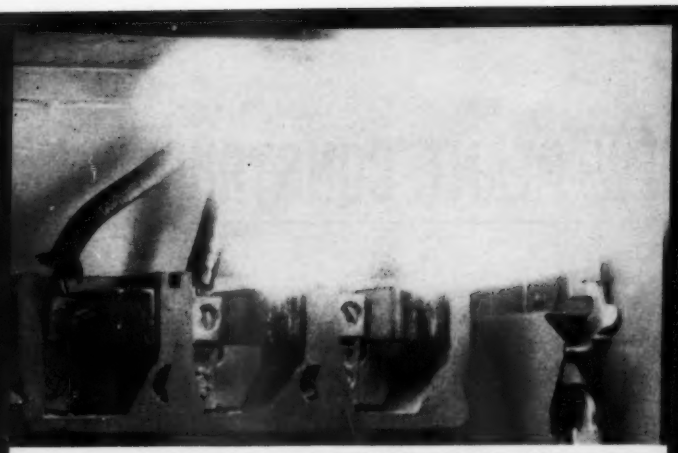
Six-Headed Dust Collection Unit Handles Ore Sintering Gases

A SIX-IN-ONE dust collector was recently delivered for installation at the Youngstown Sheet & Tube Company's Indiana Harbor Works Steel plant in East Chicago, Ind. The new collector is designed to collect dust from an iron ore sintering machine.

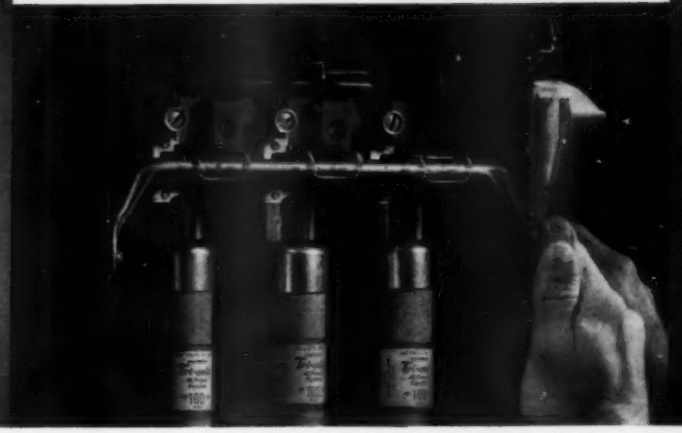
The giant unit is actually six cyclone collectors in one. It has been so designed to meet existing space requirements and to tie in with other equipment in the dust collecting system. It is rated to handle 375,000 cfm of gas at 300 F.

Used between the sintering machine manifold and an electrostatic collector, the American Blower unit includes a 42-ft-wide outlet designed to fit the electrostatic collector.

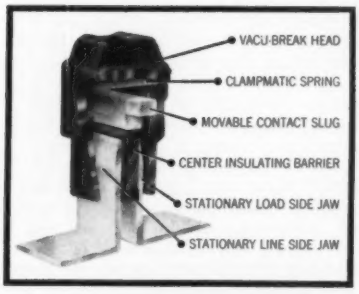
Over-all height of the equipment is 43 ft, including the cone sections of the collectors. Built of 3/8-in. hot rolled steel by the Industrial Division of American-Standard, the body scroll and cone sections are to be lined in the field.



Dangerous flash explosion occurs at instant of "break" in open knifeblade switch. BullDog Vacu-Break chamber smothers arcs before they can burn and pit contacts. Both are 100-amp, 600-volt switches operating under 90-ampere, 440-volt load with 40% to 50% power factor. (These photographs were taken at instant of "break" and are unretouched.)



FOR SAFETY'S SAKE
BUY VACU-BREAK POWER PANELS



Close-up of Vacu-Break head shows movable contact slug inside the compact arc chamber. The Clampmatic spring assembly assures a bolt-tight contact, helps speed "break". This combination guarantees positive and safe operation, long switch life.

You switch with safety when you choose BullDog Power Panels with Vacu-Break* switch units! Exclusive Vacu-Break design houses contacts in compact arc chambers that limit the oxygen supply . . . actually starve the arc before it can explode and pit or burn contacts. Maintenance is practically eliminated.

Contacts in the Vacu-Break unit are attached directly to the operating handle for positive, safe switching every time. When the handle is in the OFF position—you know the switch is *off!* For extra safety the units have interlocking doors. The Vacu-Break unit also provides clamped-pressure switching contacts to prevent overheating. Clampmatic* design simulates a *bolted connection* when in the ON position . . . accelerates the break, too!

In recent tests, Standard BullDog switches with Amp-Traps** were subjected to 100,000-amp short circuit current. They were undamaged! You can get this extra safety and long-lasting performance by specifying BullDog Vacu-Break Power Panels.

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In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

*Vacu-Break and Clampmatic are registered trademarks of the BullDog Electric Products Division. **Amp-Trap is a registered trademark of the Chase-Shawmut Company.

For more facts circle 569 on Reply Card

NEW PLANT CONSTRUCTION —advance information on location, costs

Phoenix, Ariz.—Motorola, Inc., 4545 W. Augusta Blvd., Chicago, Ill., plans to expand its semi-conductor products division located here. Plans include construction of a two-story addition that will add 90,000 sq ft to the present plant. Cost of new addition estimated to be in excess of $1 million. Plant will be completed by spring of 1960.

Brea, Calif.—Collier Carbon & Chemical Co., Los Angeles, Calif., has announced expansion plans to up capacity of ammonia plant located here. Capacity of the plant will be increased approximately 20 per cent.

Ontario, Calif.—Fruehauf Trailer Co., 10941 Harper Ave., Detroit, Mich., plans to construct a large manufacturing plant in the Vina Vista industrial and aviation tract near here. Plant will have a manufacturing area of 150,000 sq ft and will be equipped with four assembly lines, two for vans, one for flat bed trailers and one for other types of trailers. Completion is expected by late summer at a reported cost of about $2 million.

Trona, Calif.—American Potash & Chemical Corp., Los Angeles, Calif., plans to erect a boric oxide plant at company headquarters here. Construction of the unit will get under way at once for completion late this year at an estimated cost of $800,000.

Fort Collins, Colo.—Valley Packing Co. plans to construct a one-story concrete building to be used as a company packing plant. Work is already under way on the new unit which will have a floor area of approximately 15,000 sq ft and is reported to cost in excess of $235,000. Carney Construction Co., Greeley, Colo., has been awarded the construction contract. Work is scheduled for completion by the end of 1959.

Old Saybrook, Conn.—Reuben H. Donnelly Co., 305 E. 45th Street, New York, N. Y., plans to construct a printing plant to be located here. Work will get under way as soon as preliminary engineering work is concluded and plant, when completed late in 1960, will represent an investment reported to be about $2 million.

Tampa, Fla.—The Florida Nitrogen Company, a new and wholly owned subsidiary of the Southern Nitrogen Company, Savannah, Ga., plans to begin construction immediately on a multi-million dollar plant to be located here. The $3-million facility will draw its basic raw materials from the Southern Nitrogen Co. plant. Company has also announced that construction will begin on a plant to produce nitric acid. Plans now under consideration also call for the completion of an ammonia plant at a later date. This three stage plan of development will represent a total investment in excess of $7 million when completed.

Tampa, Fla.—Thatcher Glass Manufacturing Co., Inc., 100 Pollock Street, Elmira, N. Y, plans to construct a multi-million dollar glass container plant to be erected on a large building site at Tampa Industrial Park, here. Construction of the new facility is already under way and is expected to be completed by late fall.

Atlanta, Ga.—American Can Company, 100 Park Ave., New York, N. Y., plans to construct a plant here for the manufacture of beer, soft drink and food cans and composite metal-paper containers. Proposed plant will have an initial capacity of 300 to 400 million containers annually to supply packers in Georgia and part of Alabama and South Carolina.

Cartersville, Ga.—Union Carbide Corp., 30 E. 42nd Street, New York 17, N. Y., plans to construct a large plant to be located on a 15-acre building site, here, for the production of polyethylene. Work on the new facility, about 40 miles northwest of Atlanta, will begin at once for completion late this year.

Pocatello, Idaho—J. R. Simplot Co., Bank of Idaho Building, Boise, Idaho, plans to construct a 200-ton per day sulfuric acid unit at its triple superphosphate plant located here. Work on the new unit is already under way and is scheduled for completion by early 1960 at a cost of $1.5 million.

Madison, Ind.—C. G. Conn, Ltd., 1101 E. Beardsley Ave., Elkhart, Ind., plans to construct a plant here for the manufacture of electric organs. Production at the new facility, scheduled for completion by this summer, will treble company's capacity and will supplant present sub-contract work. New plant will cost an estimated $1 million.

Purvis, Miss.—Kaiser Aluminum & Chemical Co., 1924 Broadway, Oakland, Calif., will construct a large plant on a 20-acre site near here for calcining petroleum coke, a by-product of oil refining. The processed coke will be used to make carbon anodes for the electrolytic cells in the company's primary aluminum reduction plants. Investment in the plant will total about $500,000.

Arlington, N. J.—Nopco Chemical Co, Inc., Lewis and Carter Streets, Harrison, N. J., has announced that company's plastic division is starting a $500,000 plant expansion program which will triple the size of local plant here and provide six times the plant's present capacity to make polyurethane foams. Work on the new project is already under way for completion by August, 1959.

Bound Brook, N. J.—American Cyanamid Co., Industrial Chemicals Division, 30 Rockefeller Plaza, New York 20, N Y., plans to construct a multi-million dollar anthraquinone manufacturing plant which will more than double company's annual production of the chemical. The new plant will also provide additional production capacity for making methyl anthraquinone, napthoquinone and phthalic anhydride.

Murray Hill, N. J.—Ethylene Chemical Co., 247 Broad Street, Summit, N. J., has authorized plans for the construction of a one-story concrete and steel plant for the production of plastic tubing and other company products. Plant will have a floor area of approximately 15,000 sq ft and will cost approximately $200,000 when completed in the fall.

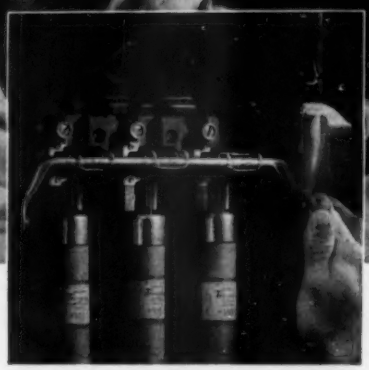
Alsen, N. Y.—Lehigh Portland Cement Co., Allentown, Pa., plans an expenditure of $7.5 million in 1959 to modernize company's cement facility here. Work involves replacing four obsolete kilns with one new large one, building a new finishing mill and erecting 20 new storage silos with a capacity of 10,000 bbl of cement each. Modernization of the plant is scheduled to be completed by the end of this year.

New York, N. Y.—Kennecott Copper Corp., 161 E. 42nd Street, plans an expenditure of about $90 million for integration and expansion of company facilities and other projects, principally at its mining properties in Arizona, Nevada, New Mexico and Utah. Besides these expenditures in its western operations, company plans to open a new $30-million electrolytic copper refinery in Anne Arundel County, Md., in the fall of this year.

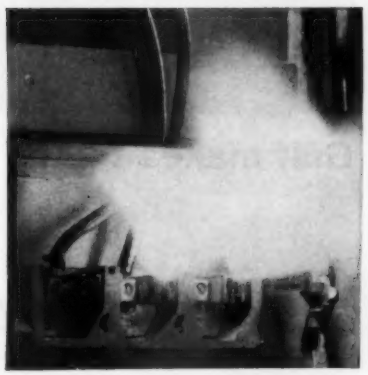
Niagara Falls, N. Y.—Carborundum Company plans to construct a plant for company's research and development division to be located here. Work on the new plant will begin at once for scheduled completion by spring of 1960. Completion of the building and procurement and installation of the equipment will represent an investment of approximately $750,000.

Niagara Falls, .N Y.—Stauffer Chemical Co., 382 Madison Ave., New York 17, N Y., plans major expansion and modernization program of company's caustic soda and chlorine plant here. Production capacity will be increased 25 per cent and all plant facilities will be converted from the present 25 cycle electric power installation to 60 cycle

(Continued on page 246)



Vacu-Break chamber, shown above, smothers arcs at instant of break before they can pit or burn contacts. Dangerous flash explosion occurs at instant of "break" in open knifeblade unit shown below.



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BullDog Plug-in Duct provides openings on 20 inch centers on either side of the duct. To tap "live" power you simply insert Vacu-Break® bus plugs. As the picture shows, reinforced fingers on all plugs insure positive pressure contact. Exclusive Vacu-Break action safeguards circuits and personnel. The enclosed arc chamber limits the oxygen supply . . . actually starves the arc before it can explode and pit or burn contacts. (The Vacu-Break bus plug has six companion plugs to meet other applications.)

Plug-in Duct is powered by Lo-X feeder duct—together they form BullDog's integrated BUStribution® system. Both ducts are available in standardized and interchangeable straight sections, elbows, tees and crosses . . . can be installed sideways, on edge, vertically or horizontally.

Do away with rewiring, downtime and costly production shutdowns! Specify *Bus Duct by BullDog.*

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Gulf makes things run better, with—

NEW GULFCROWN

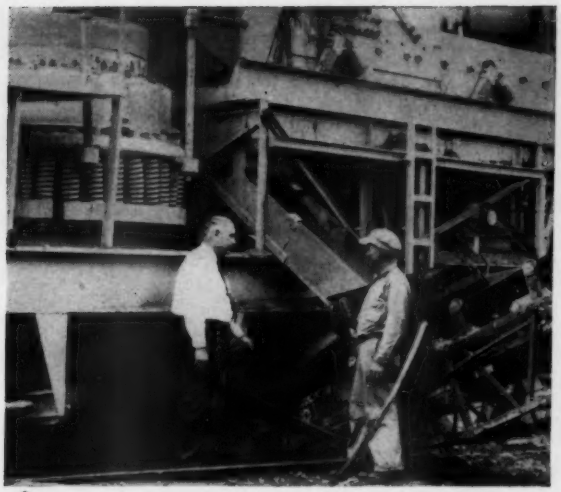
Here's a multi-purpose lithium base grease for bearings in heavy duty service.

It's a completely new bearing grease that effectively lubricates bearings operating under high loads, shock loads and with oscillating motion.

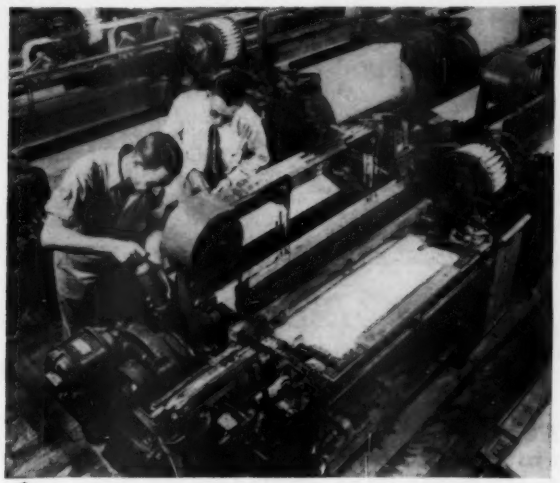
New Gulfcrown Grease E.P. will give you plenty of proof that Gulf makes things run better. It resists heat, cold, moisture and mechanical breakdown. It has excellent oxidation stability and protects against corrosion.

You'll find that this new grease pumps freely at 0°, yet stands up at temperatures to 250° F., and even higher under certain conditions.

New Gulfcrown E.P. is an unusually versatile multi-purpose grease. For example, it gives excellent results in the lubrication of heavily loaded trunnion bearings . . . steel mill work rolls and table rolls . . . sliding dog clutches . . . spiral gear boxes . . . Banbury mixers . . . the bearings, cams and gears in textile looms . . . and



In hard-working equipment, like stone crushers, new Gulfcrown Grease E.P. withstands extremely high shock loads in grease lubricated bearings.



In textile mills the excellent residual anti-weld properties of new Gulfcrown Grease E.P. makes it the ideal lubricant for loom bearings, cams, pick balls and gears.

In steel mills, new Gulfcrown Grease E.P. will successfully withstand the high temperatures and extreme pressures encountered in the lubrication of work rolls and table rolls.

GREASE E.P.

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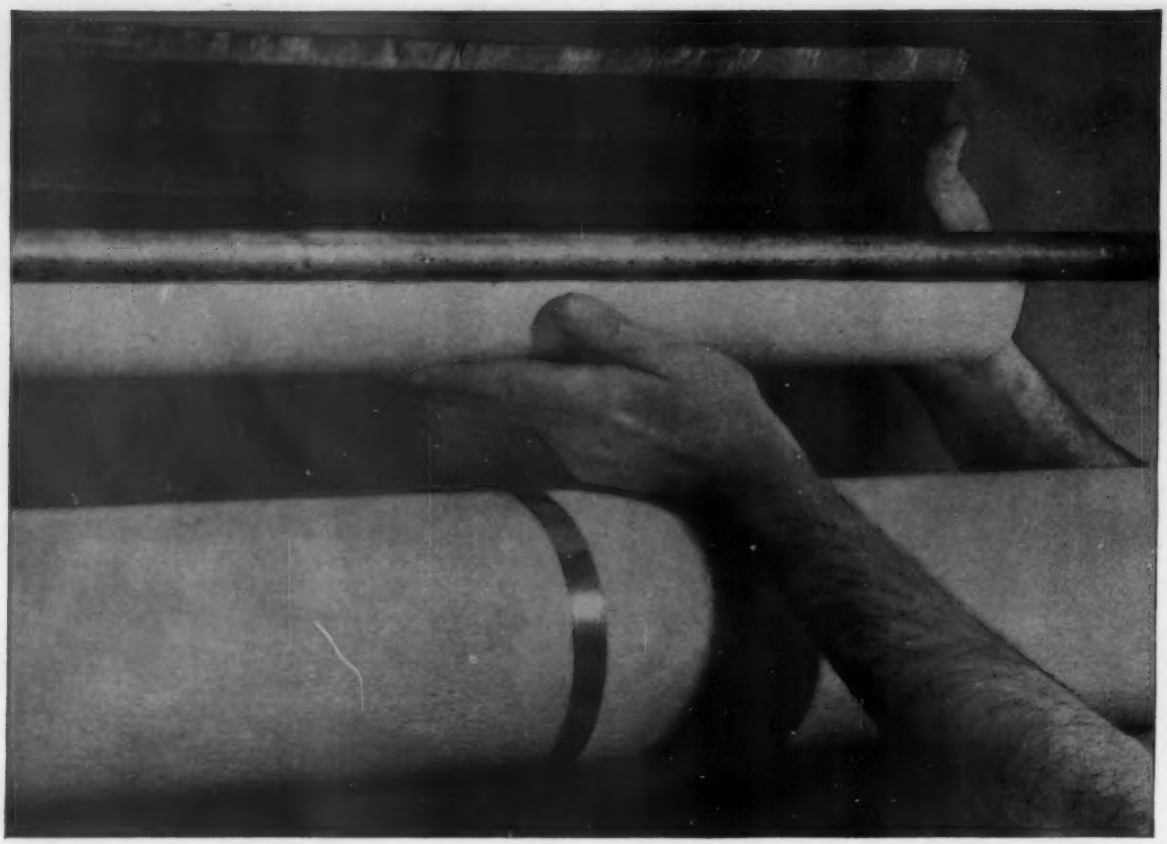

NEW FOAMGLAS® STAY-DRY PIPE INSULATION

. . . unique combination of benefits at low cost

Here's a new, low cost way to bring the unique benefits of FOAMGLAS insulation to ice water lines, chilled water lines, low pressure steam or hot water lines and other commercial piping.

It's Pittsburgh Corning's new FOAMGLAS STAY-DRY insulation for commercial piping from +35°F to +300°F . . . at prices comparable with other commercial pipe insulations.

FOAMGLAS STAY-DRY pipe insulation comes with a kraft-foil laminate jacket to provide a tough protective coating and an attractive white outer finish. It is available in nominal thicknesses of 1″ and 1½″ to fit steel pipe or copper tubing from ½″ to 6″ in size. It is furnished in 24″ lengths for quick, easy application. FOAMGLAS is also available as valve and fitting covers.

Only FOAMGLAS STAY-DRY commercial pipe insulation gives you this unique combination of benefits:

Fast, economical installation—without priming the pipe.

Insulating value can't vary—FOAMGLAS stays dry.

No extra moisture seals or vapor cut-offs—FOAMGLAS is its own vapor barrier.

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Learn more about new FOAMGLAS commercial pipe insulation. Write for bulletin. Pittsburgh Corning Corp., Dept. PE-49, One Gateway Center, Pittsburgh 22, Pa. In Canada: 3333 Cavendish Blvd., Montreal, P. Q.

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PITTSBURGH PC CORNING

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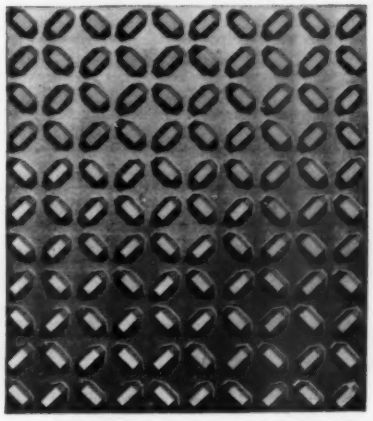
One slip can cost more than USS Multigrip

$100,000 for a single fall? Sounds fantastic, doesn't it? But there are actual cases involving suits for $100,000 or more for single falls. The average cost of injuries from slips and falls is lower than that, of course. In six states, during 1954, the cost per fall averaged close to $900.

You can eliminate many slips and falls by giving your workers a floor studded with cleats—USS Multigrip. This floor plate provides safe traction in any direction. The cleats are flat on top, easy to walk on—and do not catch the shoe.



For machine shops, loading platforms, cat-walks, and other dangerous locations, Multigrip supplies safety plus.

Where floors take a heavy beating from traffic, Multigrip will stand up for years under constant use. Oil and water won't soak in and can be easily removed from the surface with regular cleaning materials. You save money by having a floor that is easy to sweep or flush clean—and there's little or no maintenance.

On your next inspection trip, search out the danger spots—and make them safe with USS Multigrip.

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Here's why:

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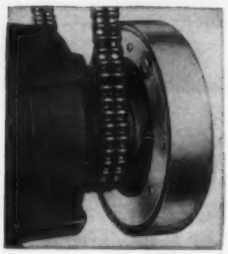
Your Whitney Service Engineer will gladly explain how these quality features can be selectively applied to your present equipment for maximum performance.

And your local Whitney Distributor has a vital "extra" in his fast off-the-shelf service on all ASA roller chains, conveyor chains and stock sprockets. Write for your copy of Whitney's helpful Roller Chain Drive Catalog.



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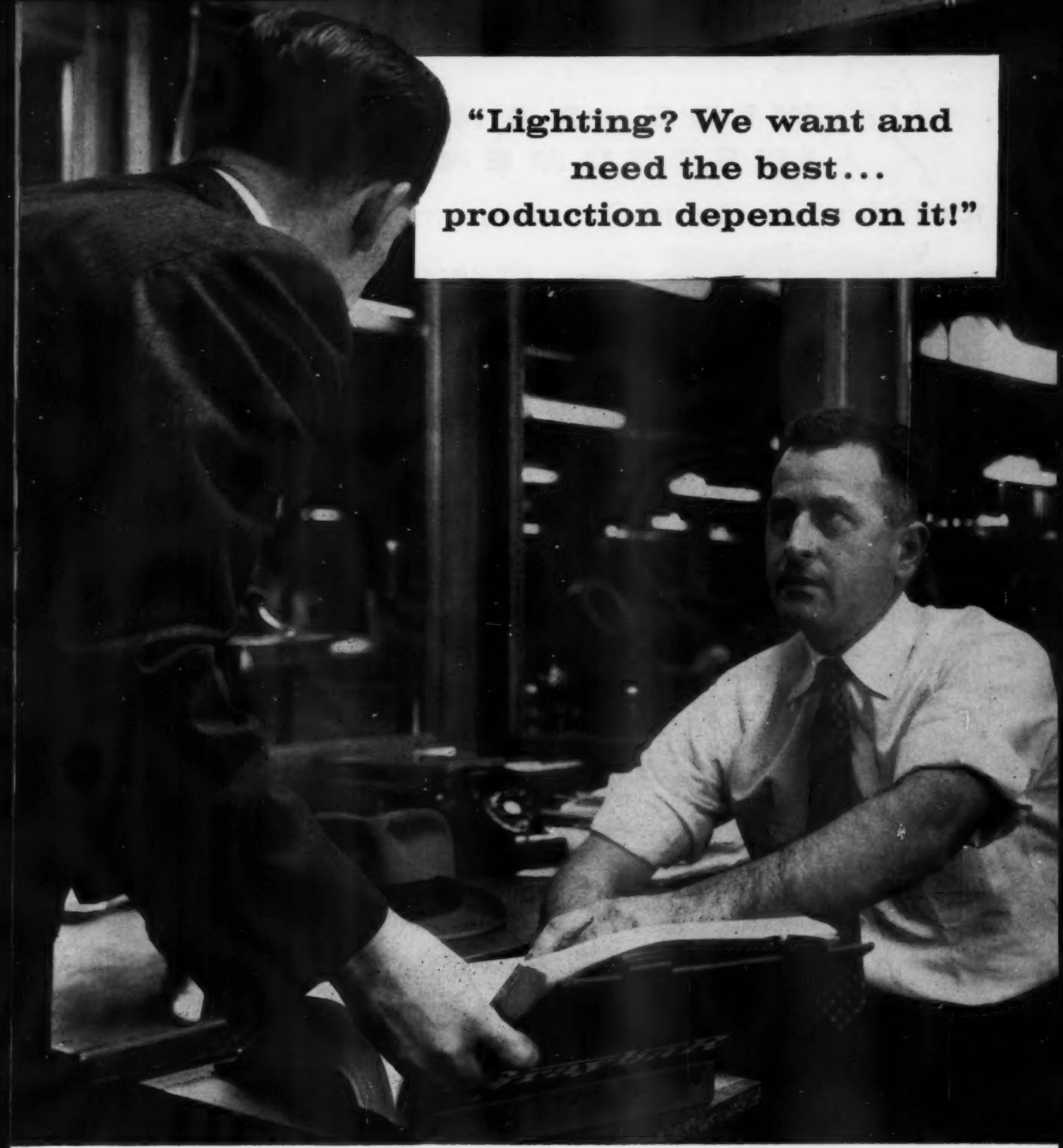

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Moreover, Graybar offers the widest selection of lighting equipment* available from *any single source!* For lighting . . . or ventilation, motors, controls, power distribution equipment . . . call Graybar. We'll work with you or your electrical contractor. 96

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for industrial R and C measurements

RANGE: 0.5 to 2,000,000 Megohms at 500v
0.5 to 200,000 Megohms at 50v
(in six decade steps)

ACCURACY (as a percent of meter indication):

Test Voltage	Low End	Mid-Scale	High End
50v	±5%	±10%	±14%
Add. ±5% error on lowest multiplier setting			
500v	±3%	±8%	±12%
Add. ±2% error on highest multiplier setting			

For Insulation and Resistance Measurements

Type 1862-B Megohmmeter, $225

- ★ Measures up to 2,000,000,000,000 Ohms Directly
- ★ Two Test Voltages Provided Internally: 50v and 500v
- ★ For Either Two- or Three-Terminal Measurements
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At AMP, Incorporated, Capitron Division, Elizabethtown, Pennsylvania, research engineer uses the 1862-B Megohmmeter for resistivity measurements of insulating liquids at elevated temperatures.

For Capacitance and Dissipation-Factor Measurements Type 1611-B Capacitance Test Bridge, $570

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- ★ 10-Billion-to-One Capacitance Range
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RANGES:	Frequency	Capacitance	Dissipation Factor
	60c	0.00001 μf to 11,000 μf	0 to 60%
	Other low frequencies up to 1 kc (external signal source required)	0.1 μf to 11,000 μf	Range proportional to frequency (0 to 120% at 120c)

ACCURACY: Capacitance, ±1% Dissipation Factor, ± $\left(2\% \text{ of dial reading} + 0.05\% \times \frac{f}{60}\right)$

ACCESSORY TYPE 1214-D 120-Cycle Oscillator . . . $100

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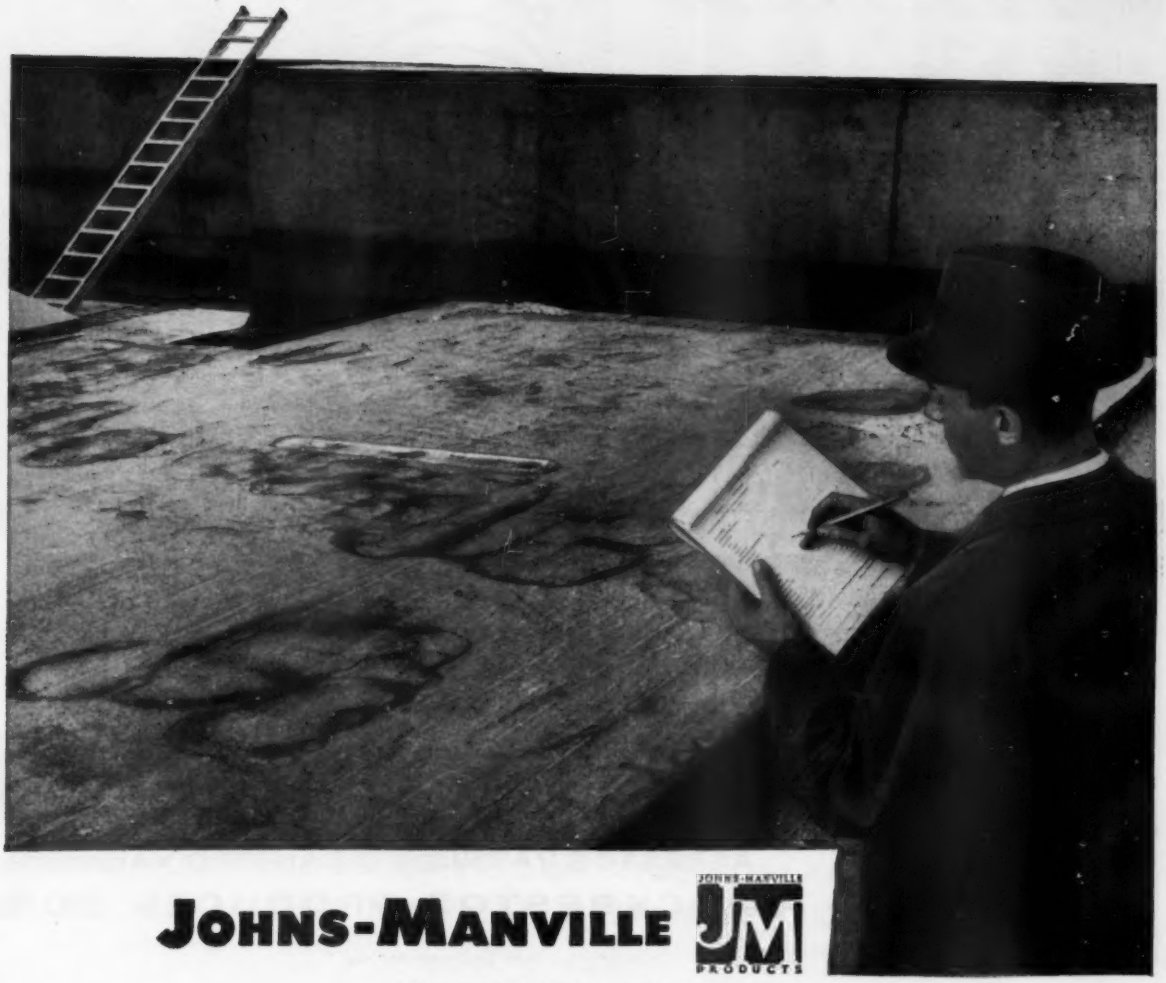

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APPLICATIONS	**Recommended for severe operating conditions in high ambient locations. For wet locations specify this construction with lead sheath. N.E.C. Type AVL.** **For details ask for catalog 10G and the AVA Manual (RMI 657).**	Recommended for secondary leads from power centers to bus ducts in armored construction. For wet locations specify lead sheath type VL or impervious sheathed armored cables. For details ask for catalog VC56.	**Recommended for wiring in high ambient, dry locations as outlined in National Electrical Code.** **For details, ask for catalog AW55.**

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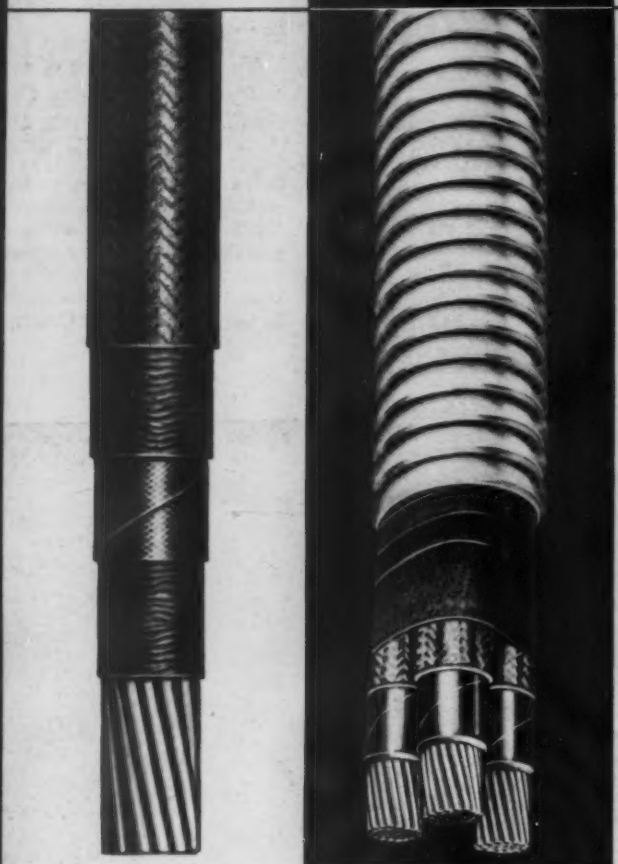

Max. Operating Temperature 230°F (110°C)
Rockbestos A.V.C. — N.E.C. Type AVA — asbestos, varnished cambric insulated

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**Teflon-duPont Reg. TM for "tetrafluoroethylene" resin*

the heaters set the cement which bonds

PNR Control Cables 600 Volts.

Other thermoplastic control cables 600 & 1000 Volts.

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Rockbestos PNR — small diameter — saves conduit space. These Rockbestos control cables are recommended for use in conduit, direct burial or exposed overhead applications. Recommended for station control cable circuits.

Combinations of polyethylene and PVC to IPCEA Standards 600 & 1000 Volts.

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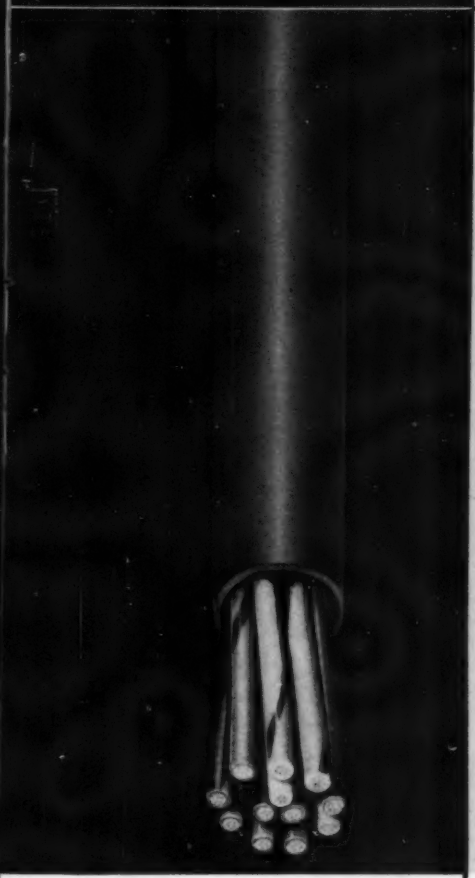

Max. Operating Temperature 167°F (75°C)

Rockbestos PNR-(polyethylene, nylon and polyvinylchloride) insulated

Power Cables 600 & 5000 Volts. Control Cables, Class H Motor Lead Wire, Heating Cable, Defroster Wire, Appliance and Fixture Wire.

Unrestricted in application — use in wet or dry locations in high ambient operating temperatures. Silicone rubber eliminates necessity for lead sheath.

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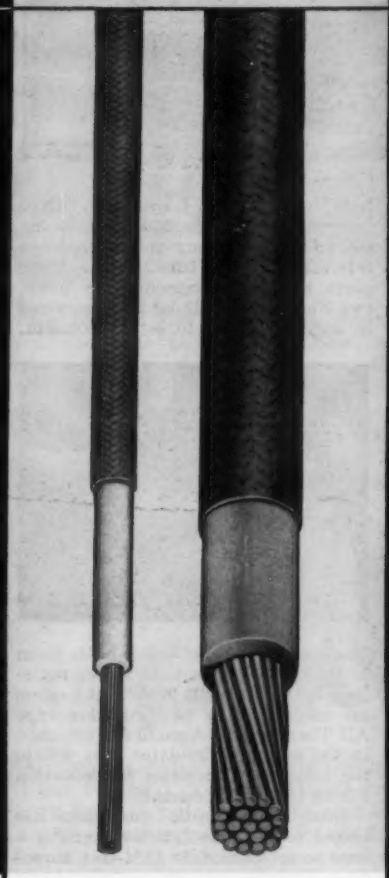


Max. Operating Temperature 257°F (125°C)

1. Rockbestos silicone rubber insulated appliance and fixture wire

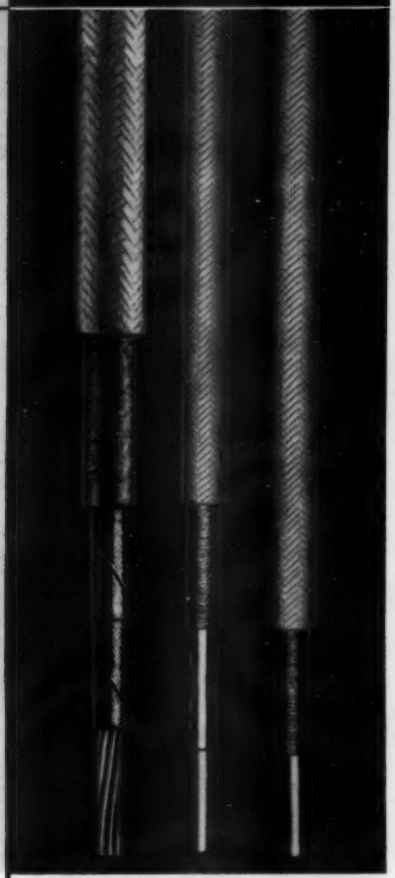
Max. Operating Temperature 392°F (200°C)

2. Rockbestos silicone rubber insulated motor lead wire

Switchboard wires, hinge cable, bus cable (600 Volts).

Underwriters' approved switchboard wires. Recommended for switchboards, control panels, induction heating apparatus, hinge and jumper connections on swinging instrument and synchronizing meter panels, etc.

For details, ask for catalog 10G.



Max. Operating Temperature 194°F (90°C)

1. Asbestos, varnished cambric — Type AVB

2. Thermoplastic and asbestos — Type TA

3. Thermoplastic Insulated — Type TBS

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NEW YORK • CLEVELAND • DETROIT • CHICAGO • PITTSBURGH • ST. LOUIS • ATLANTA
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For more facts circle 577 on Reply Card

...the U.S. Navy's new Mark 32 fibre-glass torpedo launcher

From its unlikely beginning as a fibre-glass mat . . . to its successful operation in sub-freezing sea spray . . . the Mark 32 torpedo launcher testifies to the versatility and dependability of Chromalox electric heat. Designed and built by Apex Reinforced Plastics, division of White Sewing Machine Corp., this lightweight, corrosion-resistant launcher is now in service on Navy destroyer escorts.

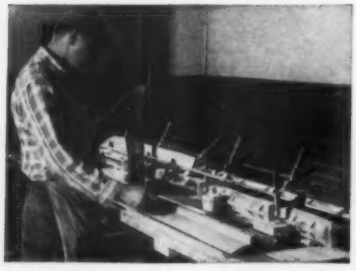
In early production stages, a Chromalox-heated hood is used in centrifugal molding of the launcher tubes.

First, a rolled fibre-glass mat is placed inside the mandrel, which is then engaged in spinning motion at 800 rpm. After thermosetting resin has been sprayed into the mandrel, the hood is lowered into position for heat curing. The Chromalox type RAD Far-Infrared Heaters have a total capacity of 36,600 watts, and reach approximately 200°F. in about 45 minutes. The hood remains on a total of about 3½ hours, throughout the spinning operation.

Before final assembly, each tube must have steel "nut bars" and "guide bars" cemented to its interior. (Nut bars connect the three tubes into one assembly; guide bars guide torpedoes into each launcher tube.) After these parts have been cemented in place, two Chromalox Tubular Heaters wired in series are used to set the cement.

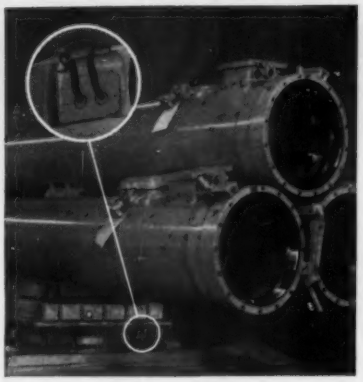
Mounted in a frame which holds them in the center of the tube for its entire length, the 240-volt, 2750-watt heaters are controlled by a Chromalox type AR Thermostat. A small fan attached to the end cap circulates heat within the tube and eliminates condensation during the drying operation.

Next, four plastic quadrants are bolted to the tube interior, forming a liner to accommodate 12¾-inch torpedoes. To each quadrant are affixed two 101-inch Chromalox Flexible Woven Heaters shown below being cemented



in place. After resin has been applied to the two channels in each quadrant, heaters are laid in place. The leads are then connected to a power outlet and the heaters set the cement which bonds them in place. In action, these heaters maintain a protective 50°F. minimum temperature for the torpedo.

The closeup below shows two leads of a circular Chromalox Tubular Heater clamped in a groove around the launcher's swivel base. To prevent formation of ice in the joint between fixed and rotating parts of the base, this heater comes on automatically when the temperature drops below 50°F.



Perhaps one of these heaters, or one of the 15,000 other types, sizes and ratings of Chromalox Heaters can answer your need for heat. For personal assistance and specific recommendations, *call your Chromalox Man for the Answers.* He's listed below.

Atlanta, Ga. TRinity 5-7244
Bala-Cynwyd, Pa. MOhawk 4-6113
Baltimore, Md. HOpkins 7-3280
Binghamton, N. Y. RA 4-7703
Bloomfield, N. J. EDison 8-6900
Boston, Mass. Liberty 2-1941
Buffalo, N. Y. SUmmer 4000
Charlotte, N. C. EDison 4-4244 FRanklin 5-1044
Chattanooga, Tenn. AMherst 5-3862
Chicago, Ill. HArrison 7-5464
Cincinnati, Ohio TRinity 1-0605
Clearwater, Fla. Phone 3-7706
Cleveland, Ohio PRospect 1-7112
Dallas, Texas Riverside 1-9004
Davenport, Iowa Phone 6-5233
Denver, Colo. GLendale 5-3651 GEnesee 3-0821
Des Moines, Iowa CHerry 3-1203
Detroit, Mich. UNiversity 3-9100
Houston, Texas CApitol 5-0356
Indianapolis, Ind. MElrose 5-5313
Kansas City, Mo. Victor 2-3306
Los Angeles, Calif. Richmond 7-5191
Middletown, Conn. Diamond 6-9606
Milwaukee, Wis. BRoadway 1-3021
Minneapolis, Minn. FEderal 6-3373
Nashville, Tenn. CYpress 2-7016
New York City, N. Y. WOrth 4-2990
Omaha, Nebraska ATlantic 7600
Philadelphia, Pa. GReenwood 3-4477
Pittsburgh, Pa. EMerson 1-2900
Portland, Oregon CApitol 3-4197
Richmond, Va. ATlantic 8-8758
Rochester, N. Y. HAmilton 6-2070
St. Louis, Mo. CHestnut 1-2433
San Francisco, Calif. UNderhill 1-3527
Seattle, Wash. MAin 4-7297
Syracuse, N. Y. HOward 3-2748
Wichita, Kansas AMherst 2-5647

7750

CHROMALOX
Electric Heat
INDUSTRIAL · COMMERCIAL · RESIDENTIAL
EDWIN L. WIEGAND COMPANY
7553 THOMAS BLVD., PITTSBURGH 8, PA.

For more facts circle 578 on Reply Card

For more facts circle 579 on Reply Card

WRIGHT HOISTS & CRANES

FOR LONGER LIFE • EASIER MAINTENANCE
LOWEST FINAL COST

ACCO

WRIGHT *SPEEDWAYS*

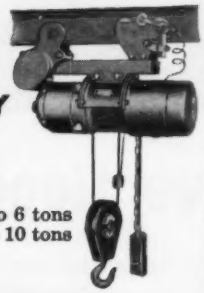
Available with single, 2-speed or variable speeds and with a wide variety of mounting arrangements

2-SPEED *SPEEDWAY* FRAME 1

Capacity ¼-ton to 1 ton. Two-speed, 1800/450 RPM motors permit precise, gentle positioning of work at slow speed...fast lifting and lowering at high speed.

***SPEEDWAY* FRAME 1½**

4-part reeved. Capacity to 2 tons ...relatively slow lifting speeds.



***SPEEDWAY* FRAME 2 FRAME 3**

Capacities—
Frame 2, ½-ton to 6 tons
Frame 3, 4 tons to 10 tons

NEW WRIGHT ELECTRIC CHAIN HOISTS

LIGHT—COMPACT—RUGGED—LOW COST

SINGLE CHAIN

Two capacity ranges as pictured. Single Chain—300 to 2000 lbs. Double Chain—3000 to 4000 lbs.

Long Life—Safety—Minimum Maintenance are assured by—

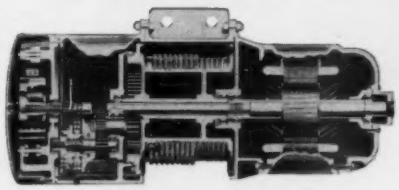
Alloy Steel Load Chain wick-oiled for longest life...heat-treated for long-wearing surface and ductile shock-resistant core—**Load Wheel, Hooks** and **Hook Couplings** drop-forged alloy steel—**Precision Ball Bearings** and **Gears** operate in oil bath—**Double Braking—Fewest Moving Parts.**

These Features make WRIGHT *SPEEDWAYS*

Capacities ¼-ton to 10 tons

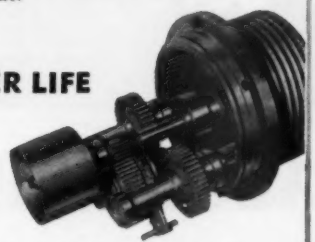
your best buy for—

MORE PRODUCTION



Fine balance and heavy-duty design make possible the continuous handling of tough jobs on any duty cycle for which a 30 minute NEMA motor is satisfactory. All gears and pinions are alloy steel, heat-treated. Their ductile core is shock resistant to severe service stresses. Anti-friction bearings throughout.

LONGER LIFE

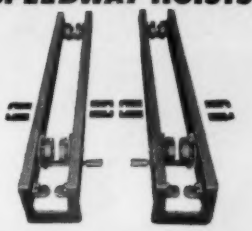


Strength of gear teeth of WRIGHT Frame 2 and Frame 3 *Speedway* Hoists has been doubled by a change in contour and grain structure of the metal. Internal gear ring with heavy flange cross section is bolted to drum at six points and provides extreme resistance to distortion.

EASIER MAINTENANCE

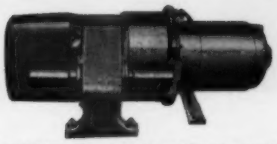
There is "*Nothing to Adjust but the Cam*" to keep the motor brake in perfect adjustment. When excessive load drift occurs...remove the screw shown at Position 1, swing the cam until Position 2 is in line and replace the screw. Position 3 is provided for the final one-third of brake lining wear. Brake springs and solenoid never need adjustment!

Build Better Cranes Save Money too! with WRIGHT END TRUCKS CRANE DRIVE UNITS *SPEEDWAY* HOISTS



WRIGHT END TRUCKS

For motor-driven cranes—both top-running and under-hung types. Timken Bearings throughout. Wide range of capacities up to 10 tons. Structural steel construction is lighter and stronger than cast frames.



WRIGHT CRANE DRIVE UNIT

For crane and double-beam trolley propulsion. Electric motor transmits power through fluid drive to well-proportioned gear reduction. Units are equipped with WRIGHT-designed solenoid "drag" brake. Size 1 Drive Unit has motors up to 2 HP...Size 2 has motors 3 HP to 7½ HP.

For Complete Information

Write for these Booklets—

DH-73A • New Electric Chain Hoist
DH-133D • Frame 1 *Speedways*
E-58 • Frame 2 & 3 *Speedways*

Motor Driven Cranes

DH-227 • Underhung, Single Bridge
DH-448A & DH-449A • Top-Running
DH-431C • Crane Drive Units

Wright Hoist Division
AMERICAN CHAIN & CABLE

York, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

with **A.W. ALGRIP** abrasive flooring

Put A. W. ALGRIP underfoot in your plant . . . you'll get safety and sure-footedness. A. W. ALGRIP eliminates sliding and slipping . . . gives you assured footing under the most dangerous plant conditions . . . on inclined as well as flat surfaces.

A. W. ALGRIP rolled steel floor plate is produced by Alan Wood Steel Company by a patented process in which an abrasive – just like the kind that is used in grinding wheels – is embedded to a specified depth. It becomes an integral part of a tough steel plate.

A. W. ALGRIP can be used as independent flooring . . . or as flooring overlay. Put your plant on a safe footing, with A. W. ALGRIP . . . Approved for Safety by Underwriters' Laboratories. Write for Bulletin **AL-N4.**

ALAN WOOD STEEL COMPANY

CONSHOHOCKEN, PA.

DISTRICT OFFICES: Philadelphia • New York • Los Angeles • REPRESENTATIVES: Atlanta • Boston • Buffalo Cincinnati • Cleveland • Detroit • Houston • Pittsburgh • Richmond • St. Paul • San Francisco • Seattle Montreal, Toronto and Vancouver, Canada—A. C. Leslie & Co., Ltd.

For more facts circle 580 on Reply Card

LOOK *for improvements in industrial handcleaners*

A NEW WAY to clean working hands

There has never been such a combination of *plus* features to keep workers' hands healthy—and therefore on the job day after day!

It's a brand new scientific formulation — non-depleting Lan-O-Kleen *PLUS*.

It's WEST'S famous Lan-O-Kleen handcleaner . . . *plus* a softer scrubbing action . . . *plus* a gentler sudsing action . . . *plus* a soothing lanolin action!

All of which combine to combat the depletion of natural skin oils while hands are being washed clean.

Highly important is the exclusive process that keeps the rich lanolin content of Lan-O-Kleen *PLUS* "free" to soothe and soften. Lanolin is impregnated into a corn meal base, instead of being "held" in the soap by conventional methods. In this way, it is instantly released for more positive, beneficial action.

Lan-O-Kleen *PLUS* is dispensed from a patented, precision-action unit. A clog-proof measuring valve with a mechanical agitator delivers a thrifty, yet adequate individual portion. More than 435 pairs of hands can be washed with each dispenser filling.

FREE TRIAL OFFER. We'd be glad to send five pounds of Lan-O-Kleen *PLUS* and loan a dispenser for free trial. Or we'll send a smaller sample for evaluation. Just call your local WEST office. Or mail the coupon to our Long Island City Headquarters, Dept. 13.

☐ Supply a dispenser and 5 lbs. of Lan-O-Kleen *PLUS*.

☐ Send a small sample of Lan-O-Kleen *PLUS*.

Name_____

Position_____

PROGRAMS AND SPECIALTIES
FOR PROTECTIVE SANITATION
AND PREVENTIVE MAINTENANCE

WEST CHEMICAL PRODUCTS INC.

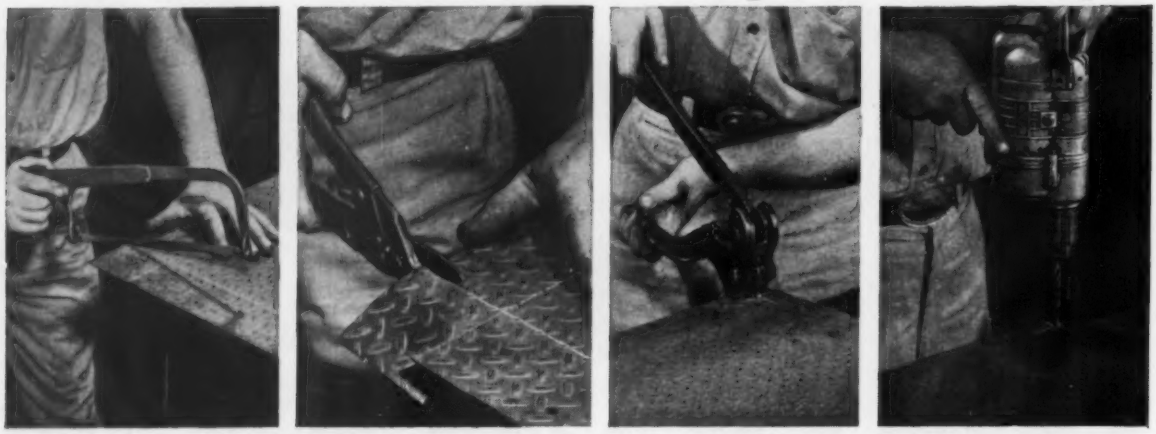
WEST DISINFECTING DIVISION

WEST CHEMICAL PRODUCTS INC.
42-16 West Street, Long Island City 1, New York
Branches in principal cities
CANADA: 5621-23 Casgrain Avenue, Montreal

For more facts circle 581 on Reply Card

ORDINARY SHOP TOOLS

can cut, bend, hammer, drill, shape, roll saw, snip



SMALL PATTERN INLAND 4-WAY® SAFETY PLATE

You don't have to spend a penny for special equipment. With just the normal tools available in your plant you can work with Small Pattern Inland 4-WAY SAFETY PLATE—use it for dozens of maintenance jobs.

Small Pattern 4-WAY SAFETY PLATE is only 18 gage, weighs only 2.4 pounds per square foot, yet has all the slip-resistant traction and safety features that has made regular 4-WAY SAFETY PLATE famous. Small Pattern 4-WAY costs less to use—less per square foot covered—than other similar materials.

It's tough, rugged, built for years of wear, yet it is light and flexible enough to carry wherever needed—work into any required form. Try it. It's firesafe, non-absorptive, easy to keep clean—the ideal material for fast, easy, low-cost maintenance use.

a few of the ways you can use light gage Safety Plate:

kick plates
tool racks
wall covering
treads on wood steps
round or square column protectors
thresholds
truck beds
resurfacing
machines tool tables
covering over worn cement stairs

AVAILABLE FROM YOUR STEEL SERVICE CENTER in 18 gage, cut to your needs in widths up to 42″ and lengths up to 152″.

AMERICAN STEEL WAREHOUSE ASS'N.

INLAND

4-WAY SAFETY PLATE
® Registered U. S. trademark

INLAND STEEL COMPANY
30 West Monroe Street, Chicago 3, Illinois

For more facts circle 582 on Reply Card

FOR EFFICIENT, ECONOMICAL POWER DISTRIBUTION

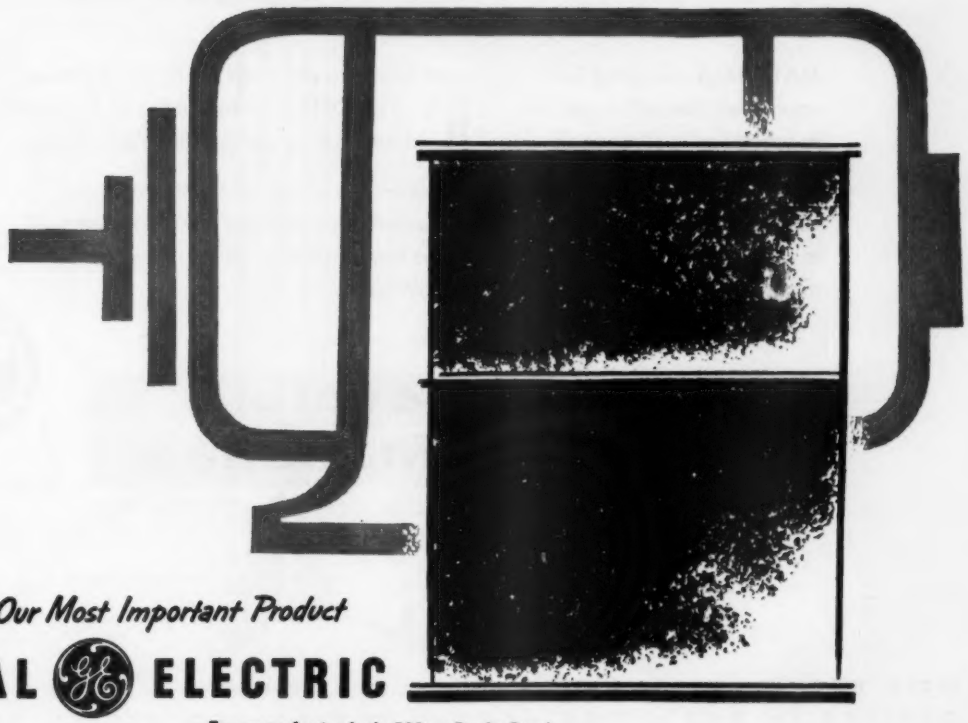
Use Capacitors With Motors

Why? Because capacitors supply the magnetizing current (kilovars) required by induction motors. This on-the-spot generation of kilovars can save you money because it reduces the current you must obtain from your utility and distribute in your plant.

Switched with motors, capacitors assure a regulated kilovar supply and free the distribution system to provide additional kilowatts. As a result, more motor, lighting and other loads may be added to the system without overloading transformers or other distribution equipment.

General Electric has a complete line of capacitors to serve the magnetizing requirements of motors. And now a new, easy-to-use selector guide is available to help you choose the right capacitors for your motors.

For your free copy of this handy capacitor guide, or for more information on G-E capacitors for industrial applications, write to: Section 446-6, General Electric Co., Schenectady, N. Y.



Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 583 on Reply Card

"Here at HONEYWELL we're control men

Honeywell
H First in Control

"We have a basic philosophy here at MINNEAPOLIS-HONEYWELL. As control specialists, we've learned that it is our *specialist's approach* to design, installation and service that enables our controls and instruments to do their best in operation.

"We feel the same way about elevators. We have 4 OTIS Passenger Elevators and 6 OTIS Freight Elevators in our Minneapolis plants. We know that they'd end up as strangely *mixed breeds* if we attempted their maintenance—because a careful study of the OTIS *specialist's approach* to maintenance has convinced us that only OTIS can keep our elevators running like new."

What is the OTIS *specialist's approach* to elevator maintenance?
It is MEN . . . MATERIALS . . . METHODS.

MEN: Elevator maintenance is no one-man job. It is an organization task requiring experts in many lines. No individual, even if he devoted his entire time to the job, could do it properly. It calls for men with an unusual combination of skills plus long OTIS training in studying parts, assemblies, functions, replacement procedures, testing and adjusting. Some degree of elevator complexity can be gleaned from the illustration at the right.

MATERIALS: Original OTIS parts and specially designed OTIS maintenance equipment are within one hour of 90% of all OTIS elevators in the U. S. for use in scheduled replacements—and to hold emergency shutdowns to a minimum.

METHODS: With more than 40,000 elevators under OTIS maintenance, OTIS has developed an actuarial procedure that replaces wearing parts well in advance of their breakdown point to hold shutdown to an absolute minimum and assure the highest possible safety.

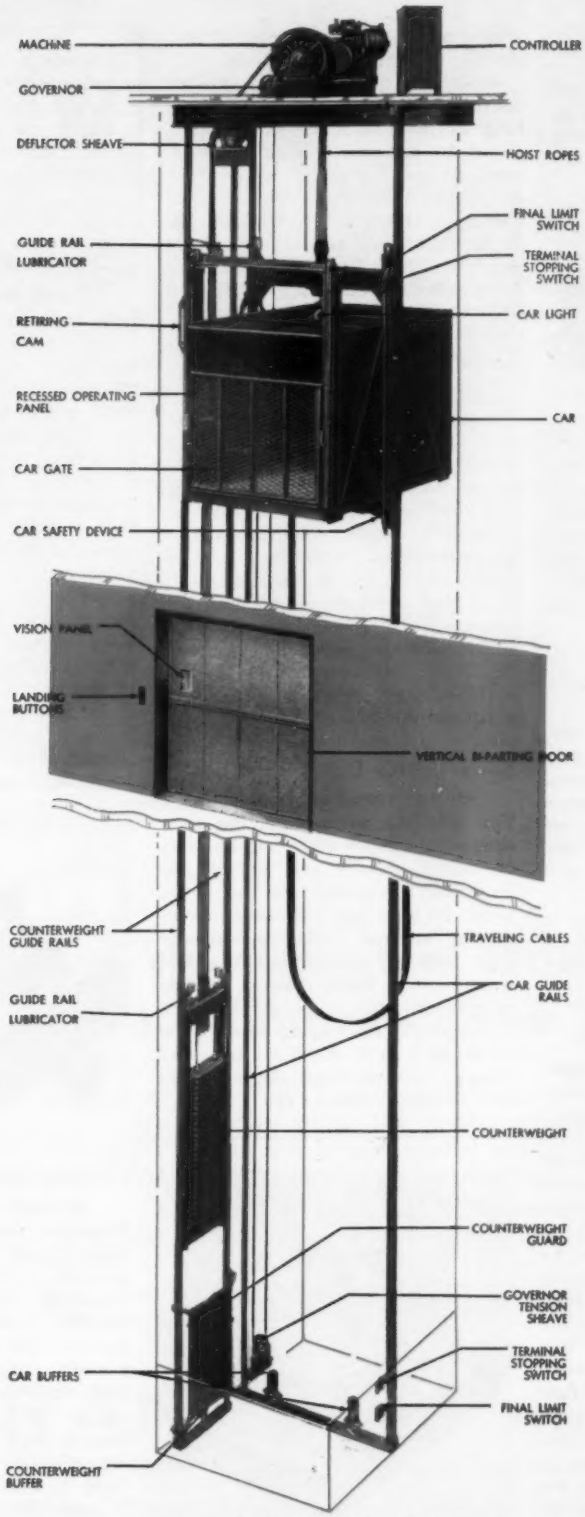
elevator maintenance

THAT KEEPS ELEVATORS RUNNING LIKE NEW

OTIS

OTIS ELEVATOR COMPANY • 260 ELEVENTH AVENUE • NEW YORK 1, N.Y.
OFFICES IN 297 CITIES ACROSS THE UNITED STATES AND CANADA

. . . not elevator maintenance men"



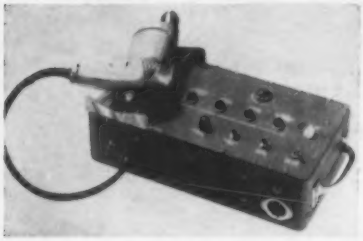
For more facts circle 584 on Reply Card

NEW PRODUCTS AND PROCESSES summarized for your convenience

Edited by M. E. Heniken

1—ELECTRICAL TESTER for tools, appliances

Model B-100 is an electrical tool and appliance tester claimed capable of almost automatically programming and testing a-c portable electrical



tools, fhp motors, extension cords and other small electrical devices within its ratings. The compact, portable instrument is designed to test for normal, open circuits, ground and shorting conditions and includes a Hi-Pot test feature within these circuits. It operates from 110-120 v a-c, 60 cycles. Pow-R-Safe, Inc.

2—DRY ACID CLEANER for industrial equipment

Based on sulfamic acid, Super-Sulfamic is announced as a dry acid cleaner ideal for removing scale and deposits from such equipment as steam boilers, heat exchangers, air conditioning and ice-making machines, and other vessels. No fumes result whether used dry or dissolved in water, company says, and it is not as corrosive as many other types of cleaners. Lee, Revere and Van Buren Chemical Co.

3—SWITCH guards against pilot flame failure damage

Nothing of a disastrous nature happens in the event of pilot flame failure to gas-fired heating operations protected by the Model SBS Safety Switch, according to manufacturer. If the pilot flame fails, this switch automatically shuts down—within 45 sec—both pilot and main fuel flow by actuating a solenoid valve, company says. Under normal conditions, a mercury-filled bulb, installed close to the pilot flame, is heated to a bright red. The switch remains in a depressed position, allowing uninterrupted flow of fuel, and an indicating dial shows normal operation. If the pilot flame is extinguished, the mercury vapor in the bulb condenses, interrupting the circuit to the solenoid valve. At the same time, an indicating needle drops, showing that pilot flame is out.

Model SBS may be mounted in any convenient location and position, as long as instrument body isn't subjected to abnormally high temperatures. Proper operating temperature is between 1200 and 1400 F. Manufacturer's Model 270-A Pilot Burner is recommended for use with this safety switch; it has a built-in holder for the bulb. Details are in Bulletin 761. The Partlow Corp.

4—PORTABLE HEATER in economy price range

This company's Economy Heater has been re-engineered for intermediate capacity and to provide approximately 40 per cent greater heat capacity, up to 270,000 Btu per hr. It operates on gasoline or fuel oil—with no adjustments necessary. According to company, its new burner assures longer, clean heat and more usable heat per gallon of fuel. Canvas ducts direct the heat to working areas, and combustion fumes are vented away. Simple controls, quiet operation are noted. American Air Filter Co., Inc.

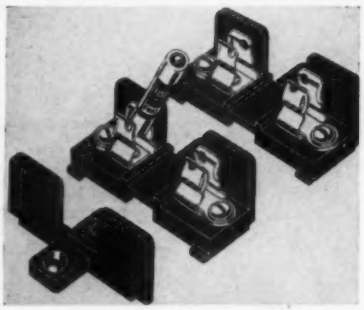
5—WIRING DUCT matches white panel interiors

This all-white wiring duct has been designed to match the white interiors of control panels and provide an improved appearance for the entire panel. Its high light reflectance allows greater internal visibility, company says, making wire installation and tracing easier. White Panduct is made of polyvinyl chloride plastic. It comes in standard sizes ranging from ½ by ½ in. to 3 by 4 in., in the open-slot design as well as closed-slot and wire-hole designs. Panduit Corp.

Use the Reader Service Cards provided on pages 249-250 to ask for more information on these products. Circle item numbers of products in which you are interested.

6—FUSE BLOCKS for multiple circuit equipment

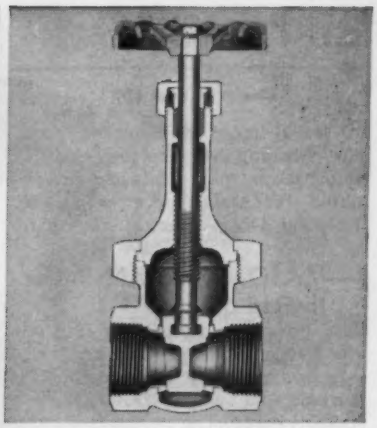
Buss Add-on Fuse Blocks are designed to simplify protection of solenoids or small motors or control apparatus on multiple circuit equipment. They may be assembled into a unit fuse block of one or any number of poles. The single pole blocks interlock by means of a boss that slips into a recess in bottom side of the adjacent block. Each unit is locked in place by a single screw. Additions may be made at either end of the assembly, and poles added or removed without disconnecting terminal leads on other units. Each fuse can be used as a circuit disconnect. Clips permit raising one end of the fuse to a right angle position to the fuse block where it will be held in place, a feature valuable for quick identification of the open circuit being worked on. Bussmann Mfg. Div.



7—DEHUMIDIFIERS are blow-through type

These low pressure and high pressure blow-through sprayed coil dehumidifiers are available in 127 sizes with capacities from 2310 to 45900 cfm and for operation to 9 in. wg static pressure. The heavy duty units feature a casing designed to provide an air- and water-tight unit when used in single zone, multizone or dual duct blow-through systems. Dehumidifiers are available with direct-expansion Type X coils or chilled water Type W coils. Both ends of cooling coils

Expanded-type body rings. Made from Crane Exelloy—a 12% chromium stainless steel. Provide a hard surface that resists abrasive damage, indentation and scoring by foreign matter. Rings are rolled in, can't work loose. Seating wear is taken by easy-to-replace bronze disc.



Quality in every detail inside and out. In rising and non-rising stem patterns—¼ to 3 inches—screwed ends. Working pressures: 200 lb. steam, 550° F.; 400 lb. non-shock cold water, oil, gas and air, 150° F.

Cylindrical body shape. Proved on high-pressure steel valves. Increases body strength without adding bulk. Distributes pressure uniformly. Reinforces seating area against distortion and chance for leaks.

12% chromium stainless steel seat rings make Crane 200-pound bronze gates last longer

Here is a close-up of Crane quality that shows you why these 200-pound bronze gate valves perform more dependably than ordinary bronze valves, with less maintenance.

For example, instead of integrally cast seats, they have long-wearing 12% chromium stainless steel body rings. Rings are rolled in... can't work loose in service. This also prevents leakage around rings. The quickly replaceable bronze disc takes normal seating wear.

Crane 200-pound bronze valves are competitively priced with bronze valves which do not have these and other important features. Why pay for less than Crane offers you? For complete facts, see your Crane Representative.

Write for Circular AD-2285. Gives complete technical data on both rising and non-rising stem patterns.

CRANE® VALVES & FITTINGS

PIPE • PLUMBING • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

For more facts circle 585 on Reply Card

NEW PRODUCTS

(Begins on page 170)

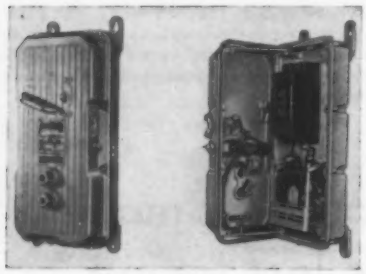
are sealed inside the casing to eliminate sweating and dripping due to condensation. Coil units can be removed for maintenance or service. Industrial Div., American-Standard.

8—MASONRY CLEANER is activated dry acid

Devil-Powder is announced as a dry acid cleaner which gets quicker action than ordinary dry replacements for muriatic acid because it is activated—contains boron. The cleaner is claimed to remove excess mortar and lime without discoloration from brick, tile, stone, glass, aluminum, stainless steel or copper, and also from tools and mixing equipment, as well as to remove dirt, grime, other deposits. Brick Research Associates.

9—CONDUIT FITTINGS for starters, breakers

Combination line starter Condulets Type DMC (dust-ignition-proof) and Type WMC (watertight, illustrated) are basically the same except for body and cover mating surfaces. These Condulets are designed to accept and operate any make of motor starters and circuit breakers. Single-speed non-



reversing combinations have a universal mounting plate, motor starter reset assembly and circuit breaker operating assembly. No substitutions of parts are required. The mounting plate is fastened to the back of the Condulet body with a knurled and slotted bolt in the center of the plate, facilitating removal of complete plate or starter or circuit breaker individually. Built-in pushbutton stations and selector switches with various contact arrangements, pilot lights and control transformers can be supplied. The cover hinging arrangement of these Condulets permits mounting directly adjacent to other Condulets without providing extra space between for cover opening. The cover pulls out, then to either side to clear adjacently mounted Condulets. Crouse-Hinds Co.

10—SPEED REDUCERS mount in three positions

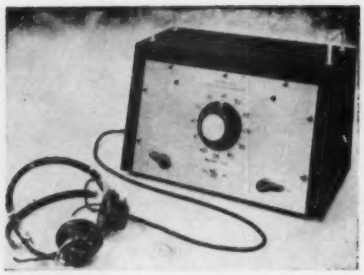
These universal worm gear speed reducers are available in 2½-, 3-, 3½- and 4-in. centers with up to 13½-hp input rating and 7240 lb-in. output torque rating. They offer three choices of mountings: worm shaft below gear, worm shaft above gear and output shaft vertical, as illustrated. Horsepower cost has been reduced by using a one-piece cast iron housing with external fins for cooling and an aluminum radial fan which directs air over the fins. Completely assembled units in a variety of ratios are available "off the shelf." Folder 2724 gives additional information. Link-Belt Co.

11—RELEASE LINING for paint spray booths

This near-permanent release lining material for paint spray booths is reported to save clean-up time and eliminate need for strippable lacquer. The technique consists of lining booths with Armalon TFE fluorocarbon coated glass fabric. Fairprene 5140 Cement is used as the bonding agent. Test installations are reported to show that the method can pay for itself in 5 months. Manufacturer says paint adheres so loosely to surfaces coated with this chemical substance that thick layers may be removed with the hands periodically for an indefinite period. E. I. du Pont de Nemours & Co.

12—DRY FILM LUBRICANT is also "instant"

This "instant" dry film lubricant, called Graphokote 200 Aerosol, sprays on by simply plunging down on an aerosol trigger. Company says it is non-greasy and does not drip or cake. Once applied, it dries quickly to provide a tough, durable film of lubricating graphite. It was designed for application to fork lift trucks, sliding doors, overhead crane hot rails and contacts, winch drums, conveyor chains in saw mills, coal chutes, scraper blades, and other machinery. Because it is unaffected by heat and cold, it won't pick up abrasive dirt that scores machined surfaces it is noted. Joseph Dixon Crucible Co.



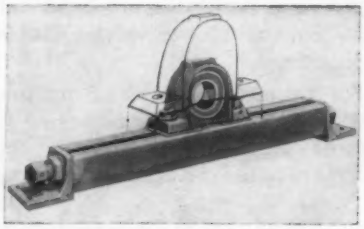
13—AUDIOMETER tests hearing deficiencies

Prime purpose of the Tonemaster Speech Frequency Audiometer is high speed screening of hearing loss percentage. This screening device is designed to tell within seconds whether or not a prospective employee has a hearing loss in the speech range and, if so, how severe it is. It is calibrated to give the overall loss in decibels and overall percentage of loss as normally computed by the AMA formula used with a pure tone audiometer —for which a full test takes much longer.

Operated by a single dial, this instrument has a pair of head phones which are placed on the ears of the person under test. The operator determines the lowest point at which the person being tested can hear the signal. From the dial a direct reading of the loss is registered. This audiometer is claimed so simple to operate that a layman can be taught to use it after a short demonstration, and it is suggested for testing large groups of persons where time is a factor and there is no need to give comprehensive tests to all. Tonemaster Mfg. Co.

14—TAKEUP FRAME uses any type of pillow block

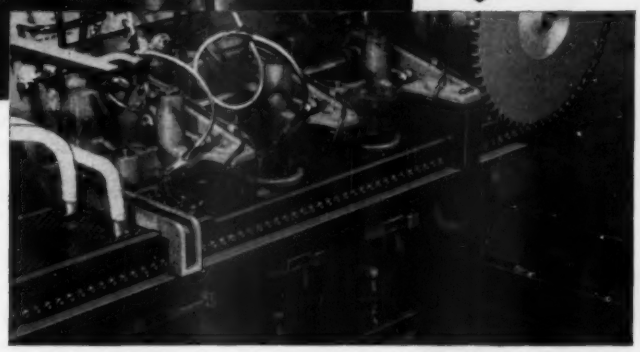
Either top or side mounted, one basic frame size of the Versa Mount accommodates all types of pillow blocks —ball, roller or babbitted. Mounting is accomplished simply by loosening a locknut, which permits swinging



flange connection either way. A large nut is mounted on both ends of adjusting screw, each ending with a heavy steel rod pin. This permits disassembly and removal of all parts without special tools. Adjusting screw

Diamond Roller Chains carry test sockets, with tubes inserted, over top of machine for preheating. Tubes continue to positions along bottom for individual testing, tapping for "opens" and "shorts," and packaging.

DIAMOND Roller Chain carries tubes to final testing position, from which they are automatically pushed from sockets for packaging or rejection.



SYLVANIA selects DIAMOND

for new high-production testing equipment

When Sylvania Electric Products, Inc. automated tube testing procedures at the Williamsport, Penna. plant, DIAMOND Roller Chain was selected by Sylvania engineers for specially designed tube-testing conveyors.

DIAMOND Roller Chains maintain accuracy and uniform pitch throughout a long, trouble-free service life . . . essential qualities in maintaining Sylvania's standards of precision testing on a production basis.

Whether your conveying application is special, unusual, or "standard," you can depend on maximum performance at lowest operating cost with DIAMOND Roller and Conveyor Chains. A complete range of types and sizes is available from stock. Call your DIAMOND distributor today! Engineering service available.

Write now for Catalog containing complete specifications and engineering data on DIAMOND Conveyor Chains, Sprockets and Attachments.

DIAMOND CHAIN COMPANY, INC. Dept. 614 • 402 Kentucky Avenue, Indianapolis 7, Indiana

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For more facts circle 586 on Reply Card

DODGE PRODUCTS you should know

TORQUE-ARM

America's most widely used shaft mounted speed reducers!

FLEXIDYNE

The Dry Fluid Drive

New soft starts . . . overload protection!

TAPER-LOCK CHAIN COUPLINGS

No reboring — no waiting!

•

Write for Bulletins!

- Torque-Arm — 55 models — data.
- Flexidyne Drives & Couplings.
- Chain Couplings and Sprockets.

DODGE MANUFACTURING CORPORATION
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DODGE
of Mishawaka, Ind.

For more facts circle 587 on Reply Card

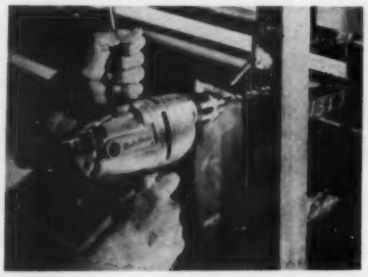
NEW PRODUCTS

(Begins on page 170)

is enclosed for protection against dirt, contamination, etc., but a face plate is removable for lubrication and cleaning. Sizes and travel lengths range from 2 to 36 in., accommodating any pillow block from 1/2 to 2-7/16 in. Lovejoy Flexible Coupling Co.

15—PORTABLE DRILL has greater torque, power

This ½-in. special drill, Catalog No. 679 has a 62 per cent power increase over company's previous models. It is suggested for extra calibre drilling in machinery, rigging, construction and



repair work. It drills diameters to ½ in. in steel, ¾ in. in masonry, 1 in. in hardwood, and drives hole saws up to 2 in. Weighing only 7½ lb, the unit is compact and close-coupled. It has a die-cast housing and standard-equipment spade and pipe handles. Other features noted are geared chuck and key, three-conductor cable and rubber key-holder, instant-release trigger switch and a price under $50.00. The Black & Decker Mfg. Co.

16—STRONG ACID for scarifying concrete floors

Scar is described as a strong acid in brown powder form which melts in water. It contains several surface active components compatible with the acid, manufacturer states, and these surfactants assist in concrete penetration. Scar is claimed to do a quick job of etching concrete prior to painting, or scarifying and roughening of concreate surfaces before repair, patching and resurfacing. It is also suggested for cleaning brick and tile. St. Louis Laboratories.

17—VERTICAL MOTORS work outdoors or indoors

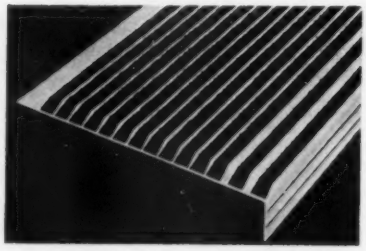
Vertical hollow shaft motors in 1 to 30 hp ratings are announced for indoor or unprotected outdoor service on shallow or deep-well turbine pump applications. Features cited include greater compactness and use of insulating materials designed to provide optimum resistance to moisture and chemical contaminants as well as mechanical strength. Construction is such as to enable fast in-the-field assembly or removal of coupling and thrust bearing with a wrench. For bearing protection the motor has an oil-metering system, sealed bearing chambers and Alnico magnet drain plugs to collect foreign ferrous particles in the oil. Full details are given in Bulletin 2500. The Louis Allis Co.

18—PLUG VALVE is light, strong and non-sticking

Series D Plug Valve—field tested to 15,000 psi—is stronger and lighter than conventional tapered plug valves, according to manufacturer; also it needs 50 per cent less turning force, can be overhauled in the lines and used in lubricated or non-lubricated service. Company says the valve never needs adjustment and cannot stick because it is not tapered. It has a straight cylindrical seat with segmented design. The plug's corrosion-resistant hard seating surface fits into a set of four metal segments serving as replaceable seats in the valve body. Seats are locked together and float slightly due to their synthetic elastomer backing. Under pressure, the seal segments rest metal-to-metal against the body. This floating segment design is claimed to prevent plug sticking. Valves come in 1- and 2-in. sizes (⅞- and 1¾-in. diam round openings). Hamer Valves, Inc.

19—SAFETY TREADS of heavy duty aluminum

Aluminum Super Stairmaster Treads are announced as featuring a slip-proof "traffic-flow" design with flat abrasive surface that provides a magnetic-like feeling when the foot touches each step. This is due to an abrasive formula bonded into the heavy aluminum base to give a subtle-but-sure grip



quality on heavy traffic stairs. Treads are 9 in. wide with beveled back, and fit steps up to 13 in. wide, lengths to 12 ft. A 1⅛ in. nose of heavy aluminum extends over the edge of the step to protect the face. These

The big advantages of Taper-Lock mounting are now available for practically all of your sprocket installations. Below is listed the new wide range of types and sizes offered by Dodge!

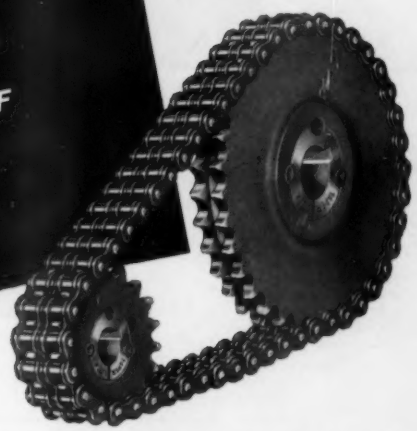
This important expansion of the Dodge line is the result of the enormous popularity of the Taper-Lock idea. Taper-Lock Sprockets are *modern*. Industry likes them because they go straight from shelf to shaft without machining—saving time. They are "easy on—easy off"—saving work. Their bushings can be re-used, not only in replacement sprockets, but in sprockets of different sizes and also in Taper-Lock Sheaves, Couplings, Conveyor Pulleys. Taper-Lock saves inventory—and money!

Dodge Taper-Lock Sprockets and Dodge Roller Chain are available through your local Dodge Distributor. Call him. Or write us for bulletin.

TAPER-LOCK®

ROLLER CHAIN DRIVES ARE NOW AVAILABLE IN A NEW WIDE RANGE OF TYPES AND SIZES

No Reboring!
No Keyseating!
No Waiting!



- **DOUBLE PITCH CHAIN and SPROCKETS**
  Transmission Series (No. 2040 to 2080) and Conveyor Series (No. 2040 to 2100). Sprockets to 112 teeth—including, for the first time, stock sprockets of 17, 19, 21, 23, 25 and 35 teeth *made especially for double pitch chain*. Introduced by Dodge, these sprockets are designed for even distribution of tooth engagement and absolute accuracy of mesh. Wear is reduced by half. Life of chain and sprocket is doubled!
- **PLATE SPROCKETS**
  Steel Plate, Type A. No. 35 to 120. Mandrel bore, bored-to-size or Taper-Lock.
- **SINGLE STRAND CHAIN and SPROCKETS**
  No. 35 to 160. Sprockets to 112 teeth.
- **DOUBLE STRAND CHAIN and SPROCKETS**
  No. 35-2 to 80-2. Sprockets to 112 teeth.
- **STANDARD ATTACHMENTS**

ALL TO ASA STANDARDS

DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER — your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look in the *white* pages of your telephone directory for "Dodge Transmissioneer."

DODGE MANUFACTURING CORPORATION, 2700 Union Street, Mishawaka, Indiana

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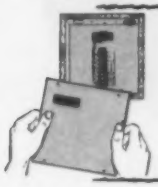
GTC

*an effective, economical industrial communication system designed to provide swift and sure voice communications regardless of distance or surrounding noise conditions.

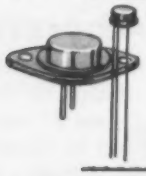
. . . THE UNITIZED COMMUNICATION SYSTEM . . .

COMPLETELY TRANSISTORIZED AND DESIGNED TO MEET THE CRITICAL REQUIREMENTS OF INDUSTRY

1. An effective, economical industrial communication system designed to provide swift and sure voice communication under adverse environmental conditions such as extremes of temperature and noise.



2. All amplifiers are "plug-in" contributing greatly to ease of installation and MAINTAINABILITY.



3. Transistors and rugged, industrial type components are used throughout. No vacuum tubes or "entertainment" type components of any kind are employed.

4. Central Control cabinet is eliminated thus reducing space requirement to a minimum.

5. ULTRA SIMPLE WIRING PLAN (no shielded cables) and UNITIZED EQUIPMENT with integral terminal facilities make for EASY LOW COST INSTALLATION and LATER EXPANSION.

* GAI-TRONICS TRANSISTORIZED COMMUNICATIONS

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GTC is extremely flexible in application. Write today for a copy of our completely illustrated, descriptive booklet and name of nearest representative.

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NEW PRODUCTS

(Begins on page 170)

treads are screwed onto wood steps, or fastened to masonry stairs with screws and lead expansion bolts. Wooster Products Inc.

20—INSTRUMENT measures and records vibrations

Mechanically operated, the Hand Vibrograph is designed to magnify and permanently record frequency, amplitude, and wave form of vibrations and other mechanical motions. It is described as compact and lightweight (under 5 lb), but ruggedly built, and the only such apparatus available with both ink and waxed paper recording

(1-in. tape) and a tape take-up reel for storing readings. It also offers variable tape speed to simplify reading of high frequency recordings.

This instrument simplifies machinery maintenance scheduling since it provides a permanent record of vibration amplitude at time of installation. Comparing vibration readings on tapes taken at regular intervals, with original tape, establishes amount of wear in bearings or cutting tools. The Hand Vibrograph can also measure rpm of rotating equipment where shafts or rotors are not readily available by placing its probe against the machine housing. It can also aid in balancing equipment, permit measurement of disturbance within a structure, and be used as a read-out for differential analyzers having straight-line motion output. The Korfund Co., Inc.

21—CHEMICAL PELLETS control woody brush

Dybar is a pelleted formulation of fenuron, one of the new substituted-urea herbicides. When the pellets are scattered over brush-infested areas, they give control with one low-cost treatment, according to manufacturer, and their ease of application gives them an advantage over liquid sprays. It is pointed out that being non-vola-

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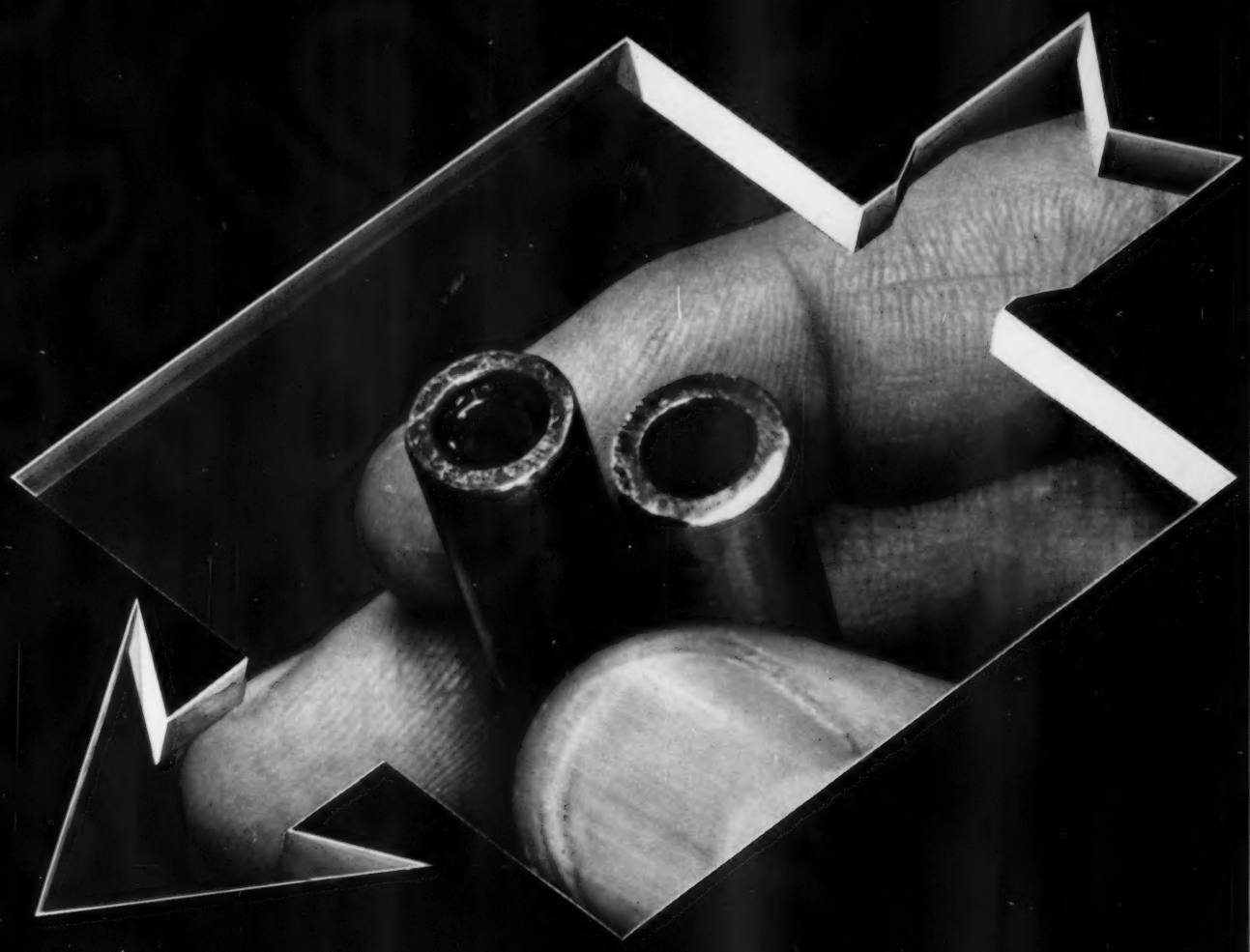
Quality–the best economy of all



Two oils...two lines...one clogged...one cleaned

A Sunvis 700 oil and a regular oil were run through two equally clogged hydraulic lines. The regular oil couldn't remove the sludge. The Sunvis 700 oil cleaned its line thoroughly. That's one job it's made for . . . to clean out sludge deposits in hydraulic lines while it transmits power.

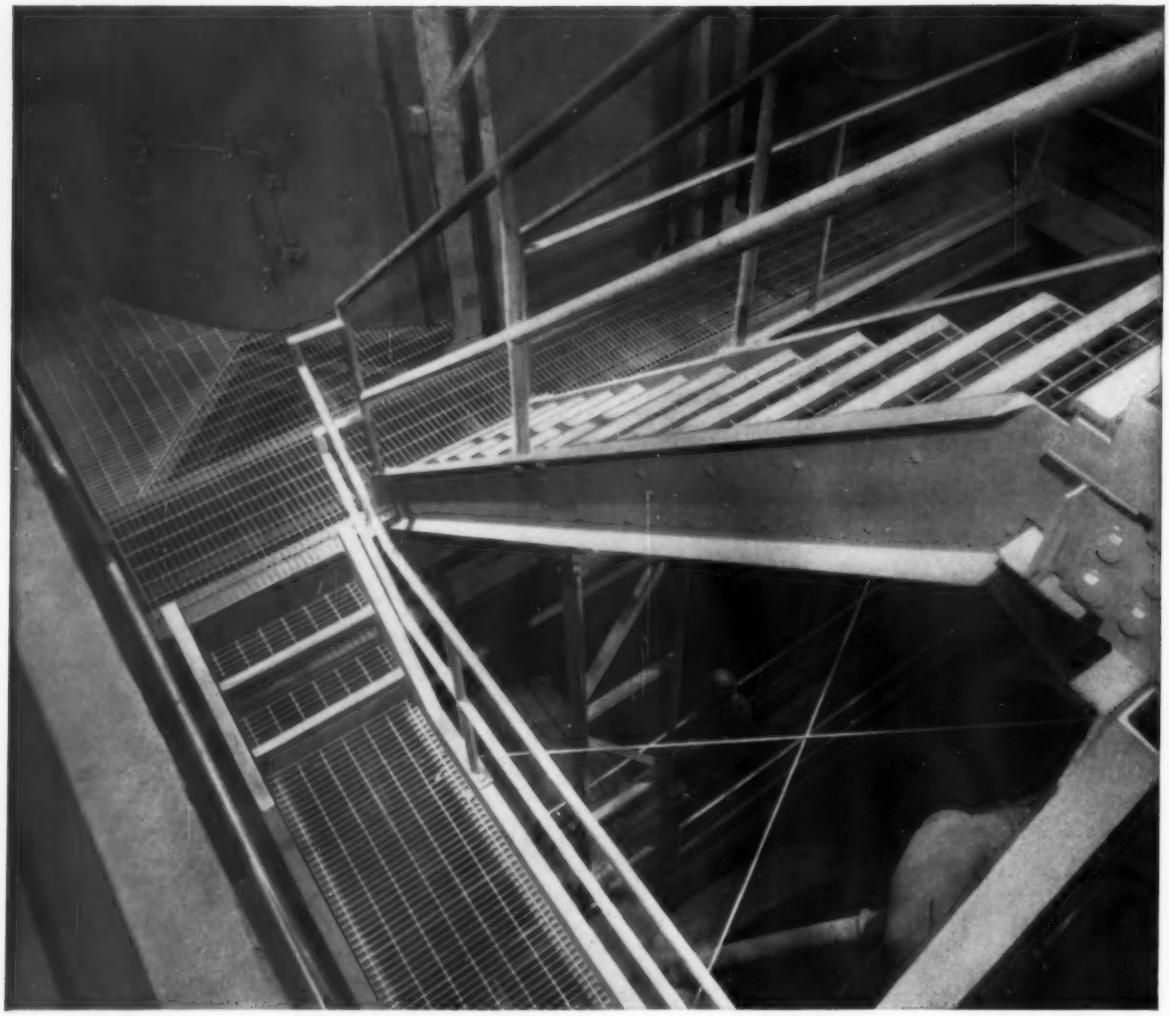
With a Sunvis 700 oil—like every Sunoco oil—you enjoy the best economy of all: the economy of quality. A Sunvis 700 oil lasts longer. The machinery it protects lasts longer. It prevents rust . . . ups output by reducing downtime.

FREE Trouble-Shooting Chart will help you spot and cure common hydraulic system troubles. For your copy, write to:

Sun Oil Company, Philadelphia 3, Pa., Department I-12.

MAKERS OF FAMOUS CUSTOM-BLENDED BLUE SUNOCO GASOLINES

SUNOCO



where good ventilation is a must...

BLAW-KNOX Electroforged® Steel Grating and Treads

Because it's open . . . because air and light can pass through and dust can filter down, cement manufacturers insist on floors and stairways of Blaw-Knox Electroforged Steel Grating.

Easily installed around pipes and machinery without altering the building, Blaw-Knox Electroforged Steel Grating provides a safe, non-slip walking surface that does not collect dirt or grease. Each section is of one-piece construction... no rivets or bolts to clog openings.

One-piece construction also adds to structural strength and load-bearing capacity. As the bars are forged together, rather than slotted, the metal is not weakened in any way.

Blaw-Knox Electroforged Steel Grating and Treads are fabricated to your specifications to meet your own operating conditions. For information on how to specify and order grating, write for Blaw-Knox Bulletin No. 2527.

BLAW-KNOX

BLAW-KNOX COMPANY
Blaw-Knox Equipment Division
Department H, Pittsburgh 38, Pennsylvania

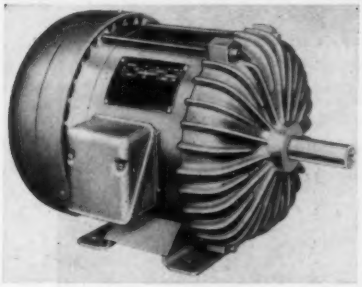
For more facts circle 591 on Reply Card

(Begins on page 170)

tile, these pellets can be used near sensitive crops, and are non-corrosive non-flammable, and present no toxicity hazard to people or animals when used as directed. The ⅛-in. cylindrical pellets are used just as they come from the package—scattered by hand, applied with a tablespoon at the base of individual stems or clusters, applied with mechanical broadcaster or spread by airplane. E. I. Du Pont de Nemours & Co.

22—SINGLE-PHASE MOTORS in two frame types

These single phase motors in totally-enclosed fan-cooled and explosion-proof frames are available in two, four, and six pole speeds in re-rated NEMA frames 182, 184, 213, and 215. Ratings range from ¾ to 5 hp. Condensers and centrifugal mechanism enclosed within front end head,



providing not only added protection for these parts, company points out, but also cleaner over-all appearance. Motors are designed for installation in any environment—in deep areas, dusty or corrosive atmospheres and out-of-doors. Metal parts are protetced with rust and corrosion resisting coatings. Motors are equipped with pre-lubricated ball-bearings which retain lubricant and seal out dirt and dust. Robbins & Myers, Inc.

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 249-250.

23—CONTROL lets compressors work near surge point

For large compressors, blowers and exhausters, the packaged CompuDyne Surge Control System is designed to improve operating stability, reduce power consumption and increase safe output of such equipment. With this

How do you Know ...unless you COUNT?

All that paperwork can mean less than nothing . . . unless it's based on up-to-the-minute "facts in figures". Figures on production and processing that prevent errors, delays, shortages, over-runs . . . that indicate maintenance and replacement needs . . . that improve work scheduling and quality control . . . and give workers a fair basis for wage and incentive payments. What's more, *built into your products*, Veeder-Root Counters will give you a new sales pitch . . . even prove your product's guarantee in service. Yes, you can count on Veeder-Root *Count*rol in countless ways . . . *to your profit*. Let us show you how. Write:

You always "Know the score" when you count on Veeder-Root!

New High-Speed Predetermining Counter, Series 1522, features instant lever reset plus quick and easy setting of predetermined number. Speeds up to 6,000 rpm. Also supplied without predetermining feature. .

New "Count-Pak", a complete electronic counting package for use where high speed, long life and instant reset are required. Rated at 20,000 counts per minute (with added decade speeds run up to 200,000 cpm). *Completely transistorized.* Photohead adaptable to any job. Several other "Count-Paks" available.

Everyone can Count on Veeder-Root INCORPORATED

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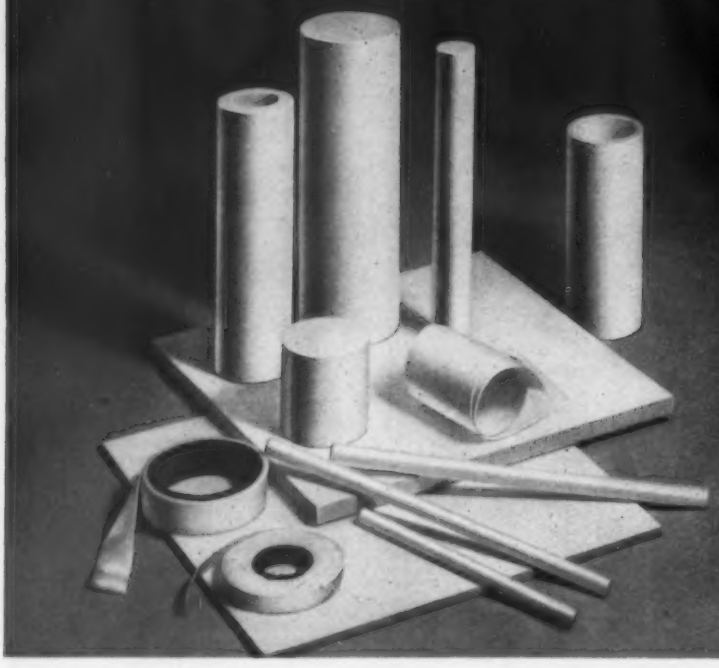
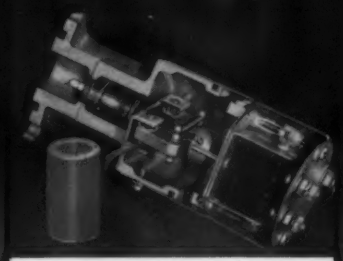
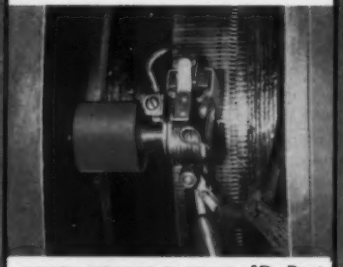
Make durable repair parts quickly and easily...



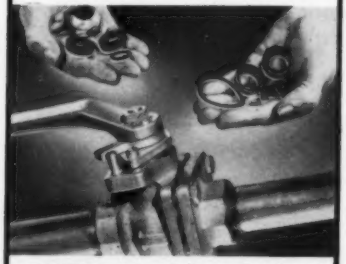


BEARINGS of Du Pont TFE resins replace lubricated bearings in overspeed governor. Bearings are easily machined from rod stock; require no lubrication.



BRUSH-HOLDER SLEEVES of Du Pont TFE-fluorocarbon resins in motor generator resist arcing, provide long service life, and simplify maintenance.

EROSION SHIELD machined from a TFE resin snaps over impeller shaft nut of chemical pump, protecting it from rapid erosion by swirling reactants.



VALVE SEALS permit easy turning of ball valve . . . defy corrosives. Tough, durable seals can be cut from standard shapes of TFE-fluorocarbon resins.

by stocking versatile standard shapes of TEFLON TFE-fluorocarbon resins

Use standard shapes of TFE-fluorocarbon resins to make rugged replacement parts: Slice simple components such as seals and washers from tubular stock. Machine more intricate shapes from solid bar stock. Cut sheet to form gaskets and anti-friction facings. Wind tape snugly and safely about high-voltage conductors. Often the quick replacements you make from standard shapes of TFE resins will be far more durable than the original part. You save money by eliminating lost production time and by simplifying maintenance.

Du Pont TFE resins are totally unaffected by almost every known chemical, including the most violent corrosives. They are practically perfect dielectric materials and have a continuous temperature rating of 500°F. Because of the extremely low surface friction and anti-stick properties of TFE resins, you can easily fabricate "self-lubricating" bearings and large-area sliding surfaces.

See your local supplier of Du Pont TFE resins for a good selection of standard shapes, and start saving on repairs and downtime. Or for our new booklet "*How to Use Sheets, Rods, Tubes, Tape and Other Standard Shapes of TEFLON*", write today to your supplier or to: E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department, Room T-334, Du Pont Building, Wilmington, Delaware.

In Canada: *Du Pont of Canada Limited, P.O. Box 660, Montreal, Quebec.*

Unlike many other non-metallic materials, articles of TEFLON TFE resins can be ordered against meaningful specifications to insure your receiving a standard product. Your supplier, who fabricates TFE resins, is prepared to furnish you with stock shapes in the best combination of sizes and the best combination of properties.

DU PONT REG. U.S. PAT. OFF.

TEFLON®

TFE-FLUOROCARBON RESINS

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

TEFLON *is Du Pont's registered trademark for its fluorocarbon resins, including the TFE (tetrafluoroethylene) resins discussed herein.*

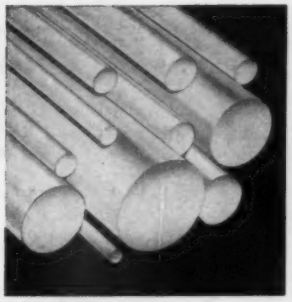
For more facts circle 593 on Reply Card

Cadillac Announcement

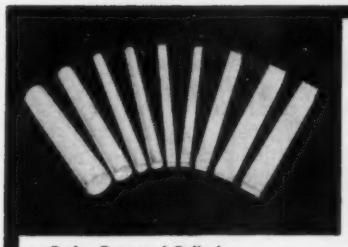
We now manufacture standard Teflon shapes!

CADILLAC PLASTIC and CHEMICAL COMPANY

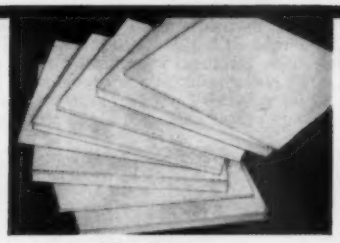
COMPLETE STOCKS IN 11 WAREHOUSES COAST-TO-COAST



Cadco Teflon Rods
Finest quality, non-porous. Can be turned quite easily like soft brass on any standard metal working lathe. Complete range of diameters and lengths.



Cadco Bars and Cylinders
Triple "A" quality and uniform density. Easily machined. Available in various diameters and wall thicknesses. Also made to your specifications.



Cadco Teflon Sheets
In a wide range of sizes and thicknesses. Can be sawed, drilled, punched, stamped and sheared.

Cadco Teflon Tubing
Flexible and tough. Has wide useage for electrical, chemical laboratory and other applications. Complete range of diameters and lengths.

"cadco"
Manufactured
TEFLON SHAPES

SHEETS • TAPE • TUBING
RODS • BARS • CYLINDERS

Cadco Teflon Tape
Non-porous and extremely strong. Available in grades for mechanical, electrical and general purpose use.

In our new ultra-modern plant . . . "CADCO" brand TEFLON is manufactured under the most rigid controls to assure you of uniform high quality. Large production capacity enables us to maintain complete inventories for quick delivery on all orders.

Send for new "Cadco" Teflon Brochure and prices.

cadillac plastic and chemical company

WRITE NEAREST ADDRESS OR REQUEST NAME OF DISTRIBUTOR IN YOUR CITY

Detroit 3, Michigan, 15111 Second Blvd.

Chicago 6, Illinois, 727 W. Lake St.
Cleveland 13, Ohio, 3333 Detroit Ave.
Cincinnati 10, Ohio, 1200 Walnut St.
Milwaukee 2, Wisconsin, 517 N. Broadway St.
Los Angeles 57, Calif., 2305 W. Beverly Blvd.
St. Louis 3, Missouri, 2111 Olive St.
Kansas City, Missouri, 1517 Grand Ave.
Dallas 7, Texas, 2546 Irving Blvd.
South San Francisco, Calif., 313 Corey Way
Houston, Texas, 6426 Long Drive

HEADQUARTERS FOR NEW IDEAS

For more facts circle 594 on Reply Card

Industry Wide...

CONNOR

dorex® PURIFIES AIR TO PROTECT PERSONNEL and EQUIPMENT

Like the P. H. Glatfelter Paper Co., many manufacturers who use expensive, sensitive production equipment can't afford to risk its damage by destructive atmospheric pollutants.

At Glatfelter, for instance, 78 soundly engineered Dorex Type C-42 Air Purification Cells decontaminate intake air to protect personnel and sensitive electrical equipment against the heavy concentrations of chlorine gas unavoidably caused by certain production processes.

Offering great arrangement flexibility (shown here installed in one central location), Dorex is the most practicable, effective, economical method yet developed to meet every demand for proper air purification. Dorex acts just like a gas mask . . . using activated carbon to adsorb air entrained impurities. This adsorbing action purifies contaminated air and readies it for safe, sanitary re-use in air conditioning systems. And Dorex is designed in various type C-Cells and Canisters to provide economically the optimum purification required by the degree of air contamination involved.

Additionally, Dorex offers a systematic replacement service which ensures your system's continuous operation. Request new Dorex Bulletin 108A—it fully describes how Dorex equipment and service can benefit *you*.

CONNOR... for Constant Comfort Conditions

CONNOR ENGINEERING CORPORATION

DANBURY • CONNECTICUT

CONNOR ENGINEERING CORPORATION dorex® air recovery

For more facts circle 595 on Reply Card

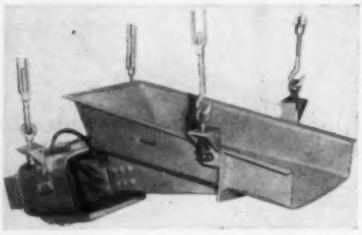
NEW PRODUCTS

(Begins on page 170)

system compressors can be safely operated nearer the surge point than formerly possible, company states. The system can be used on units from 50 hp up. It consists of electronic sensing, measurements and control instruments, plus an electro-hydraulic or electro-pneumatic actuator and control valve as final control elements. Data Bulletin 4007 gives further information. CDC Control Services, Inc.

24—VIBRATORY FEEDER, heavy duty, high capacity

With a capacity conservatively rated at 50 tons per hour, the Hi-Vi Vibratory Feeder, Model V3B-70A is described as a powerful, rugged and compact unit for heavy materials handling applications. It incorporates many features of company's smaller vibratory feeders, including an electro-permanent magnetic drive system which operates directly from alternating current without a rectifier, is completely enclosed, and maintains its accuracy and uniformity without adjustment. Also, like the smaller models,



the 70A employs a spring system of epoxy-bonded fiberglass. Quiet operation and modern lines are also announced.

While essentially an automatic constant-volume feeder of bulk materials in a wide range of particle sizes, the 70A is also adapted to spreading, drying, or agitating materials, handling hot materials, or moving materials into hot areas. A simple variable autotransformer type control is furnished to vary the applied line voltage permitting adjustment to optimum feed rate. Model 70A is available as a suspended (illustrated) or base mounted unit. Trays are mild steel or stainless, flat or tubular. Eriez Mfg. Co.

25—PAINT PUMP is air-operated, portable

Pogo 5 has a 2-to-1 delivery ratio and is designed to fit into any standard 5-gal pail. Manufacturing plants needing quick color changes for light production painting as well as maintenance

Wherever the four winds blow... this trademark stands for

matchless power exhauster performance

Here's why . . .

Jenn-Air developed the first spun aluminum, low contour exhauster years ago. This was a milestone in exhauster design, but it was by no means Jenn-Air's last word on the subject. Product improvement is a never-ending project at Jenn-Air, and this emphasis on engineering has netted rich dividends over the years. Examples of exclusive features developed by Jenn-Air include:

• **U-spring suspension**—Compensates for both radial and lateral movement to reduce vibration and noise. 44% more effective than rubber isolaters. Unconditionally guaranteed for life!

• **Integral balance**—In addition to dynamic and static balancing of blades, Jenn-Air exhausters feature *integral* balancing of blade with motor. This is an important contribution toward further noise reduction.

• **High point of discharge**—Motor is nested in the housing to provide the highest discharge point of any roof exhauster. By eliminating the need for a high curb base, this feature also makes possible Jenn-Air's attractive "low contour" design.

Every Jenn-Air exhauster that comes off the production line is individually tested for sound level, motor load and insulation breakdown. Only units which can pass these rigid tests are accepted for shipment. Air moving capacities range from 175 to 22,700 cfm and are AMCA-certified. Write for Bulletin 58-B.

JENN-AIR

Jenn-Air Products Co., Inc
1102 Stadium Drive
Indianapolis 7, Indiana

Member of Air Moving and Conditioning Association

For more facts circle 596 on Reply Card

SPENCER Vacuum

Assembly and Gaging Dept., Miniature Precision Bearings, Inc., Keene, N. H.

KEEPS "WHITE ROOMS" WHITE

Dirt and dust are strictly bad news around gaging or assembly areas of a company producing precision ball bearings. Every possible precaution must be taken to assure an absolutely dust-free atmosphere in the "white rooms".

That's why, at plants like this modern Miniature Precision Bearings, Inc. factory, you'll find SPENCER vacuum cleaning systems providing *sure* sanitation.

Whether your cleanliness requirements are critical . . . or whether *convenience* and *economy* of maintenance are primary, you'll find a SPENCER system the answer to your needs.

Write for complete information on SPENCER installed vacuum cleaning systems or request a piping layout to meet your particular requirements.

The SPENCER TURBINE COMPANY
HARTFORD 6, CONNECTICUT

OTHER QUALITY SPENCER PRODUCTS

PORTABLE VACUUM CLEANERS

PNEUMATIC CONVEYING SYSTEMS

BLOWERS

For more facts circle 597 on Reply Card

NEW PRODUCTS

(Begins on page 170)

painting will find this pump useful for lacquers, primers, and decorator finishes. Air motor and pump section are separated, eliminating possibility of paint entering air motor or other critical part. A fluid pressure gage and pressure adjustment control serve to assure an even regulated flow of paint to spray gun. Supplying up to 1 gpm of paint, pump requires only 3 to 6 cfm of air for constant operation. Prices start at about $170.00. Binks Mfg. Co.

26—REGULATORS for the hard-to-handle fluids

These sliding gate regulators with Thermon jackets are announced as a solution to heat transfer problems associated with viscous or hard-to-handle fluids. The Thermon jacketing surrounds steam tracing lines and keeps

fluids from hardening or solidifying. It is claimed more efficient than conventional tracing and less expensive than steam jacketing, and is removable for access to regulator. Manufacturer of the jacketed regulators says they work equally well for heating or cooling applications, are suitable for pressures to 250 psi, temperatures to 406 F. They come in ¼- through 6-in. sizes. Details on these regulators are provided in Bulletins SRB 4-59 and J-160. OPW-Jordan.

27—FLOOR TOPPING resists chemicals, traffic

Duratrem is a heavy duty flooring reported to have exceptional resistance to solvents and chemicals, to withstand heavy trucking, and have an attractive non-slip finish. Light gray in color, it is suggested for use in food processing plants, chemical and petroleum industries, and wherever manufacturing conditions present slippage of mild organic acids, alkalis, hot water, grease and oils. Company

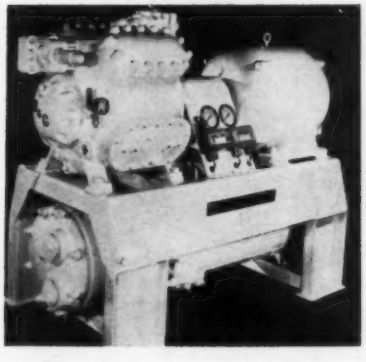
says it is easy to apply, can be feather edged, requires no compacting and normally needs no primers. It is said to take light traffic after 12 hr, heavy after 24 hr. The Tremco Mfg. Co.

28—LIQUID CLEANSER for stainless steel, Monel

Formula 875 is a free flowing liquid for cleansing and polishing any metal having a highly finished surface. Its ingredients are designed to emulsify oily dirt yet retain enough body to "pick up and carry away" heavy, insoluble dirt. According to company, it includes emollients for extra mildness and to assure safety to high finish surfaces. It comes in re-usable 12 oz. squeeze bottle. Bar-Ray Products, Inc.

29—CONDENSING UNITS built low and compact

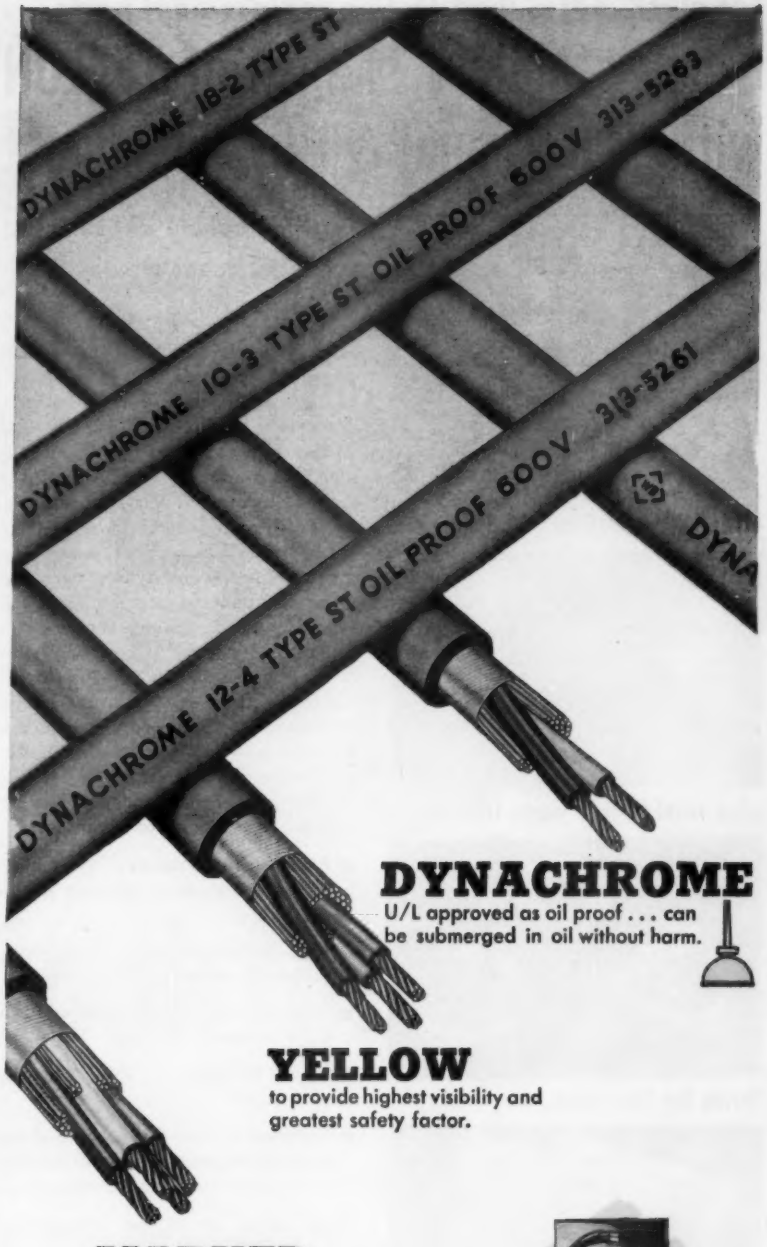
Announced as the shortest available, these condensing units come in 7½- to 150-ton capacities and are suggested for refrigeration and air conditioning applications wherever a large cooling capacity is required. In these units all parts and components (compressor, motor, condenser and base) are products of the manufacturer, facilitating parts replacement, and parts are completely interchangeable. Part sizes in



components of the smaller units are the same as those in the larger models. A low center of gravity, with parts protected within a steel frame, offers protection against damage in shipping and installation. Moving parts and controls are on top of the unit for accessibility. Bulletin CU-758 gives more information. Bell & Gossett Co.

30—LOW COST CRANE has big crane features

Big-crane performance at a price considerably lower than the big-crane bracket is announced for the Thrif-T-Crane. Design features such as life-lubricated bearings give this crane a compactness which saves materials without sacrificing strength, it is stat-



DYNACHROME
U/L approved as oil proof . . . can be submerged in oil without harm.

YELLOW
to provide highest visibility and greatest safety factor.

MARKED
clearly with type, size and number of conductors, as well as catalog number, all for easy identification.

Write today for new FREE catalog

WELL BUILT WIRES SINCE 1899

WB WHITNEY BLAKE CO.
NEW HAVEN 14, CONNECTICUT

TELEPHONE CHestnut 8-5515 TWX: NH84

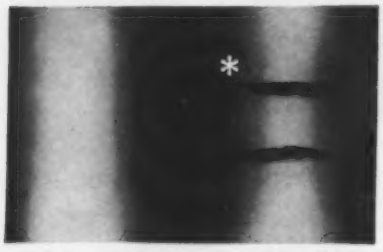
For more facts circle 598 on Reply Card

For quick, easy, long-lasting replacement parts . . .

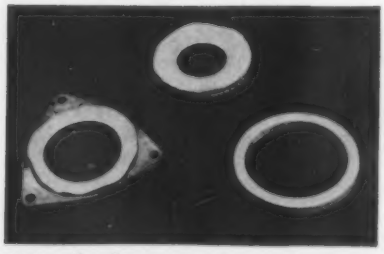
Stock standard shapes of TEFLON with "X-ray quality" by Chemplast

Products like these . . .

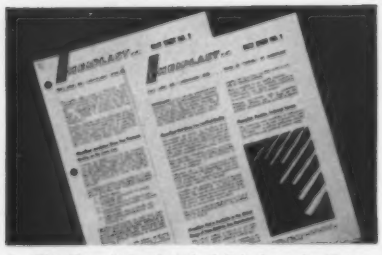
with "X-ray quality" like this . . .



give trouble-free parts like these.



Write for literature.



* The Chemplast rod at the left is shown by X-ray photograph to be completely free from cracks and fissures. In contrast, defects are plainly visible in another commercially available rod, shown at right.

Certified quality of Chemplast products means maximum properties

When you need a gasket, bearing, seal, packing, liner, O-ring or anti-stick surface . . . you'll find it quick and easy to requisition a sheet, rod, or tube of Teflon from your own stock, and machine the part on the spot. A supply of standard shapes of Teflon in your stockroom can prove invaluable for such uses.

Chemplast sheets, rods, and tubes give you "X-ray quality" . . . complete absence of the voids and fissures sometimes found in massive moldings of Teflon is assured by checking with X-ray photographs. In machining operations, this prevents loss in machining time and cost for rejects. It means finished parts with the utmost in reliability and maximum physical properties.

Chemplast sheets, rods, and tubes also give you these big advantages:

- **Freedom from Stresses** . . . eliminating need for stress-relieving before machining.
- **High, Uniform Density** . . . for better properties, better machinability.
- **Widest Range of Sizes Available** on a stock basis.
- **Prompt Delivery** . . . from our complete stocks.
- **Technical Service** . . . on end-use applications, machining and fabrication problems, product design.

Write today for further information . . . we'll give a prompt quotation on your needs in standard shapes. All products made from virgin "Teflon" . . . meet AMS 3651B and MIL-C-17B specifications.

See Du Pont ad on page 180 for further information on maintenance uses of standard shapes.

CHEMPLAST

INCORPORATED

3 Central Avenue, East Newark, New Jersey

TEFLON is the Du Pont Company's trademark for its fluorocarbon resins.

For more facts circle 599 on Reply Card

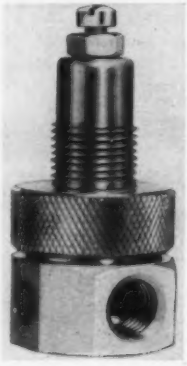
NEW PRODUCTS

(Begins on page 170)

ed, and additional economies are effected through pre-engineering and use of mass-produced parts. Chief among innovations is a geared-type timing belt, easily accessible for routine servicing. The Thrif-T-Crane also incorporates hydraulic braking, three-reduction hoist, and provision for control from a cab or from the floor of the shop. A folder, "Keep Your Capital Investment Down," describes the Thrif-T-Crane. Whiting Corp.

31—REGULATORS for air flows up to 20 cfm

Small pressure regulators in the new 20AR Series are only 3-1/32 in. high by 1-3/8 in. hex, for air, water and non-corrosive gases and liquids. They are designed for economical handling of air flows to 20 cfm at 100 psi air pressure and to provide reliable pressure regulation even with fluctuating line pressure and varying air flow.

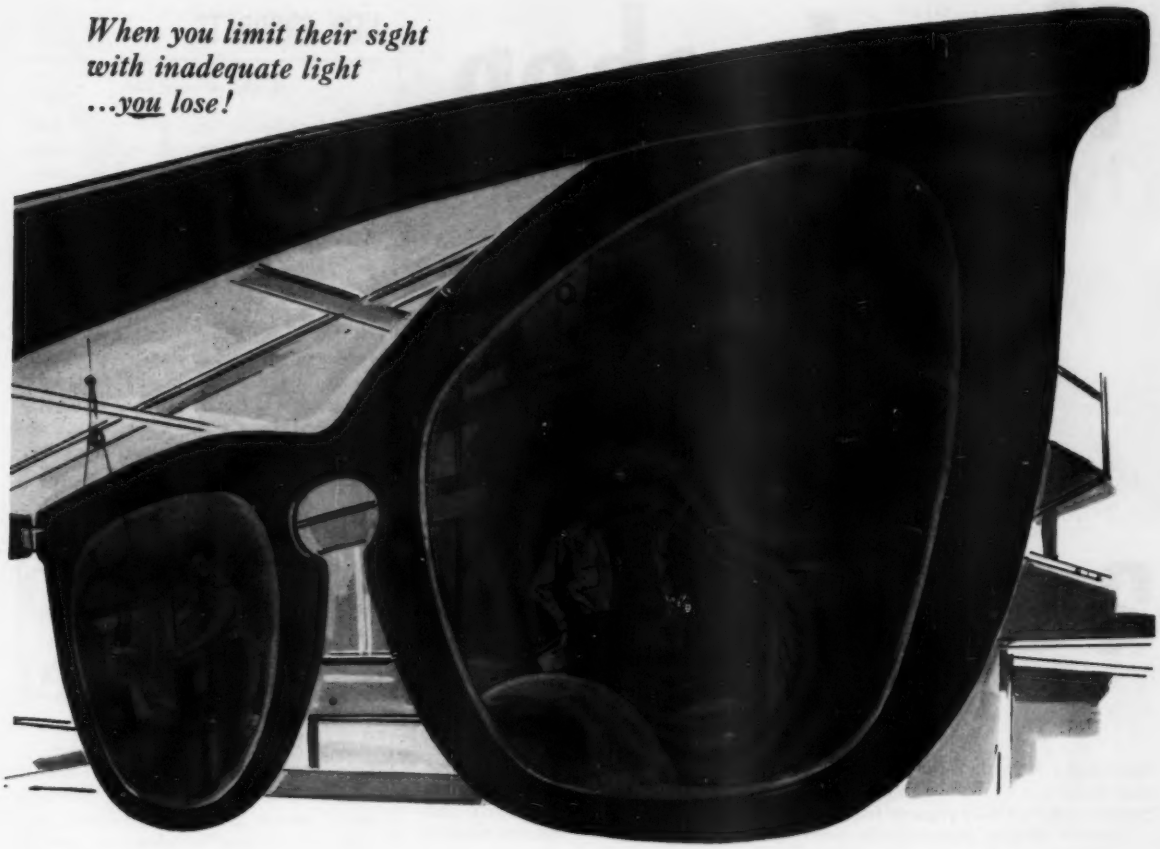


Company says they can be used at a maximum primary pressure of 400 psi, maximum delivery pressure of 100 psi; maximum operating temperature is 200 F. The regulators have a brass bonnet and body, nylon-reinforced Buna-N diaphragm, Buna N seat, hand-removable bonnet, in-line pipe connections, and can be serviced without removal from air line. They are furnished with or without a ⅛-in. NPT gage port, 1½-in. diam, 160-psi capacity back-mounted pressure gage, for left-to-right or right-to-left air flow. The regulators are low in cost—prices start around $4.00. Brochure 918 gives details. C. A. Norgren Co.

32—FLOW SWITCH protects pumping units

Basic function of the Series C Flow Switch, when installed on a pumping unit, is to protect the pump if the fluid

When you limit their sight with inadequate light ...you lose!



Dim outlook for output

Inadequate light in your plant slows down production, reduces output, increases accidents. Yet *only 15 per cent* of America's business lighting is adequate by modern standards!

Plants that have modernized their lighting have found that more is needed than just *enough* light! You need high quality, comfortable lighting—Eye-Fi Relighting. Eye-Fi Relighting is *eye-fidelity* lighting, that comes as close as possible to natural daylight. It is scientifically designed to increase profits.

Plant managers say:

Eye-Fi Relighting **ups output.** Modernized lighting increases production, lowers overtime costs.

Eye-Fi Relighting **reduces rejects.** Planned, well-designed lighting improves vision, cuts down costly errors and inaccuracies.

Eye-Fi Relighting **lessens fatigue.** Workers are more alert, more productive; morale is raised.

Eye-Fi Relighting **protects both you and your workers** by minimizing accident hazards.

Eye-Fi Relighting **improves office work, too.** Well-planned lighting helps office personnel to increase efficiency and productivity, reduce errors.

Ask your utility or electrical contractor about Eye-Fi Relighting (in some areas, Certified Eye-Fi Relighting). And be sure your new fixtures carry the Eye-Fi Relighting label.

eye-fi RE/LIGHTING

Write today for free brochure

A CONSUMER SERVICE ADVERTISEMENT SPONSORED BY THE NATIONAL LIGHTING BUREAU

155 EAST 44 STREET, NEW YORK 17, NEW YORK

For more facts circle 600 on Reply Card

How to chop 13 weeks off a startup date

Hustling a new plant into operation, engineers at a western manufacturing company were badly pressed for time.

Needed almost immediately were two large heavy-duty mixers for fluids.

A long wait would mean soaring standby expense, lost income, a decisive edge for competition. And the usual manufacturing time for the mixers they needed was *16 weeks.*

One of the engineers phoned a LIGHTNIN Mixer representative. He, in turn, phoned the MIXCO factory. How soon could we ship two 50-horsepower LIGHTNIN Mixers, each equipped with a turbine impeller big as a dining-room table on a shaft 18 feet long, 4½ inches in diameter? And could we supply the lower shafts and impellers *with rubber covering?*

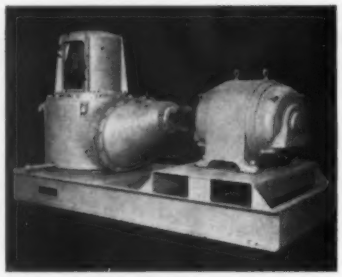
Six tons in 18 days

His call set off a swift, far-reaching chain reaction. Just 18 days later, we put nearly six tons of mixers aboard a fast truck—both units completed and shipped *13 weeks ahead of normal.*

Magic? No—just speed. We're set up for it because we build nothing but mixers. We build them fast when you need them fast—because we stock a tremendous range of mixer components and parts, in materials that match just about any process requirement.

And we have the manpower, the machines, and the know-how to give you the right answer to any fluid mixing problem in your plant. Rapidly.

For competent engineering help, call your LIGHTNIN Mixer representative (you'll find his name in Thomas' Register). Or write, wire, or phone us direct.



PAYOFF for engineer in a hurry: two 50-hp LIGHTNIN Mixers like this one—built in 18 days.

"Lightnin' Mixers"

MIXCO fluid mixing specialists

MIXING EQUIPMENT Co., Inc., 144-d Mt. Read Blvd., Rochester 3, N.Y.

In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Ave., Toronto 19, Ont.

For more facts circle 601 on Reply Card

NEW PRODUCTS

(Begins on page 170)

should cease for any reason. If flow stops, switch will shut down the pump, to prevent bearing damage or overheating from lack of fluid flow. It can also be used to shut down pump if flow becomes excessive, such as when a pipeline fails. When installed as a flow alarm, the switch will indicate a change in flow conditions, activate an alarm system or start a stand-by pumping unit. This switch consists of an actuating vane, in the flow line, mechanically linked to a magnetic plunger. This plunger operates a magnetically operated microswitch, external to fluid line. Ball Mfg. Co.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 249-250.

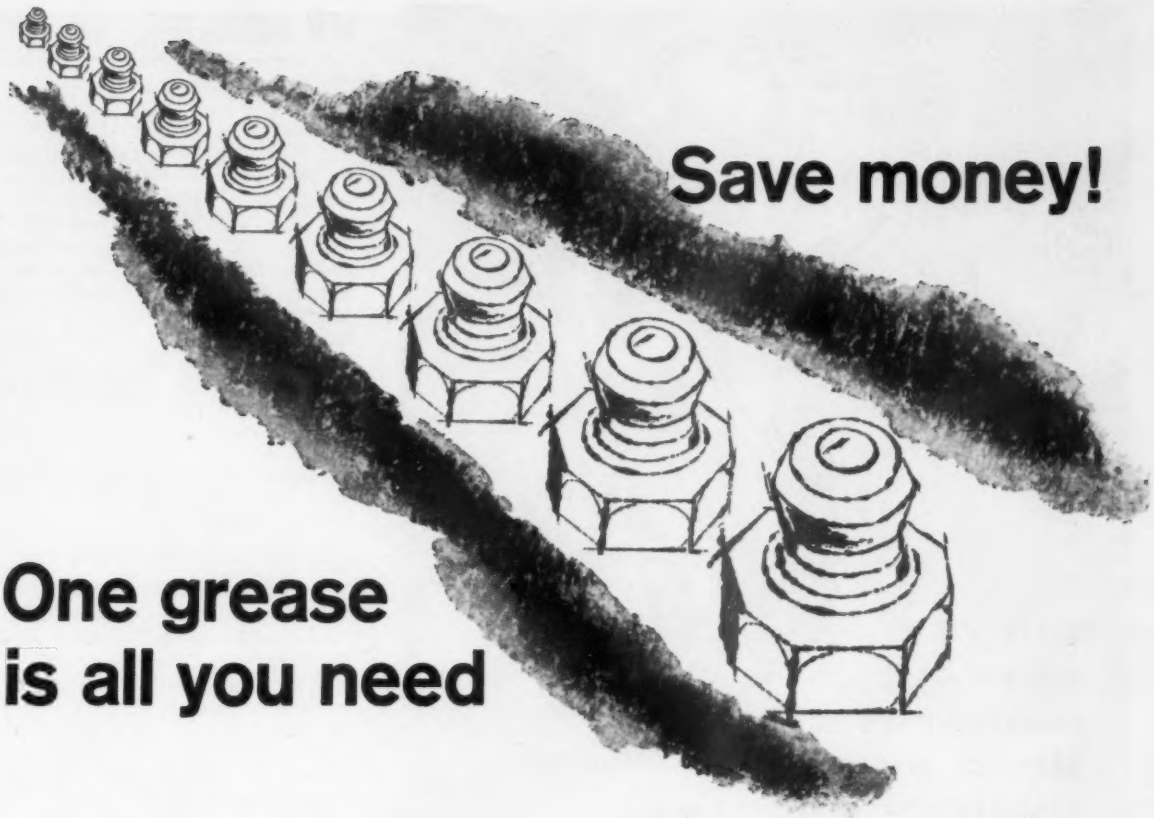
33—FUNCTIONAL WALLS can support heavy loads

The Panelok System is a "working wall" system in which additional storage shelves can be added as needed. Perforated metal lockstrips between the 2-ft wide panels support the shelf

brackets, which may be spaced at 1-in. intervals. Designed to go over old walls or over studs, the edge-grooved panels are attached to the steel splines, previously mounted to studs placed 24-in. oc or to horizontal furring strips 16 in. apart. Panels may be left unfinished or painted. They also come grain imprinted. Masonite Corp.

34—HOT SPRAY VINYL forms quick-drying coating

This hot spray vinyl is a high solids vinyl solution designed to give 5 mils of protection in a single spray coat. Manufacturer states that the formulation and spray technique allow de-

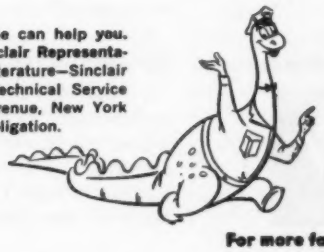


Save money!

One grease is all you need

If you use several greases to lubricate your plant equipment—stop! You'll save money with Sinclair Litholine® Industrial Grease because this one grease simplifies inventory, saves time. Recommended for all types of bearings. It has also earned an enviable reputation for high temperature bearing performance and mechanical stability. When management asks how you've cut costs, tell them you've switched to Sinclair Litholine and show them the results.

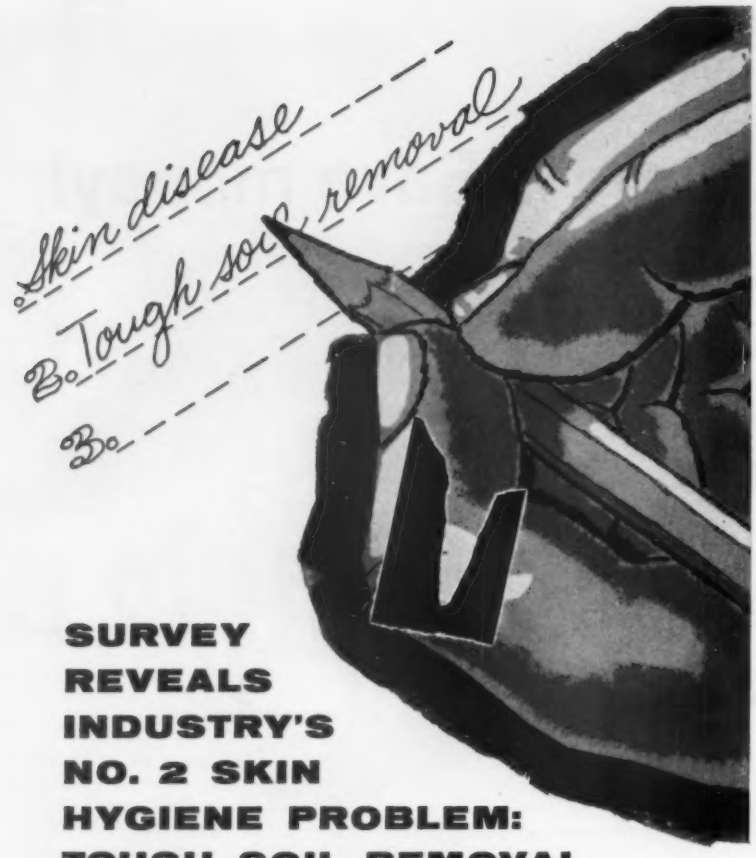
Find out how Litholine can help you. Call your nearest Sinclair Representative, or write for free literature—Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. There's no obligation.



SINCLAIR

Litholine® Industrial Grease

For more facts circle 602 on Reply Card



SURVEY REVEALS INDUSTRY'S NO. 2 SKIN HYGIENE PROBLEM: TOUGH SOIL REMOVAL

Here's help on the problem from SBS

A recent survey of 2,177 major plants pinpoints industry's most serious skin hygiene problems.

1. *SKIN DISEASE and*
2. *REMOVAL OF TOUGH SOILS*

Naturally, the second contributes to the first. Because tough soils invariably lead to the use of harsh cleaners and solvents when proper cleaners aren't handy. Heavy greases, resins, tars, and similar soils resist ordinary skin cleaners, and when the worker finds he can't remove them, he resorts to solvents or other materials that injure his skin. Result: skin disease, poor employee relations, cost and waste.

What can you do? Ask an SBS representative to show you "Operation Pinpoint", 10 minute sound slide digest of the national survey, and you'll see how *a planned corrective program* can solve these skin hygiene problems. Because SBS produces a *complete range of cleansers,* he can suggest the right cleanser for each job. For the safest answer to tough soils, write today . . . Dept. 3-D.

the washword of industry

SBS sugar beet products co.

SAGINAW, MICH. • Los Angeles, Calif. • Newark, N.J
CANADA: Chemical By-Products, Ltd., Toronto, Ontario

For more facts circle 603 on Reply Card

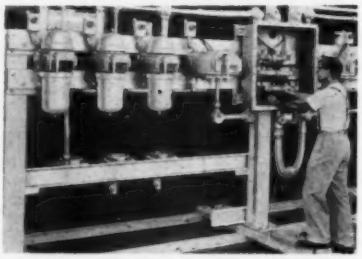
NEW PRODUCTS

(Begins on page 170)

posit of a heavy quick-drying film, with little overspray and excellent edge build-up and resistance to sagging. Applications include tank exteriors and other vessels for varying chemicals services and as a maintenance coating. The product is said to have a long shelf life, dry rapidly to a tack-free, low gloss film of moderate flexibility. Coating can be applied with any standard hot spray apparatus which embraces circulatory system and spray gun. Unit coat thickness of 5 mils is obtained with one-half fan width on each stroke, thus required thickness may be built up in fewer coats. Gates Engineering Co.

35—MOUNTING RACK for explosion proof enclosures

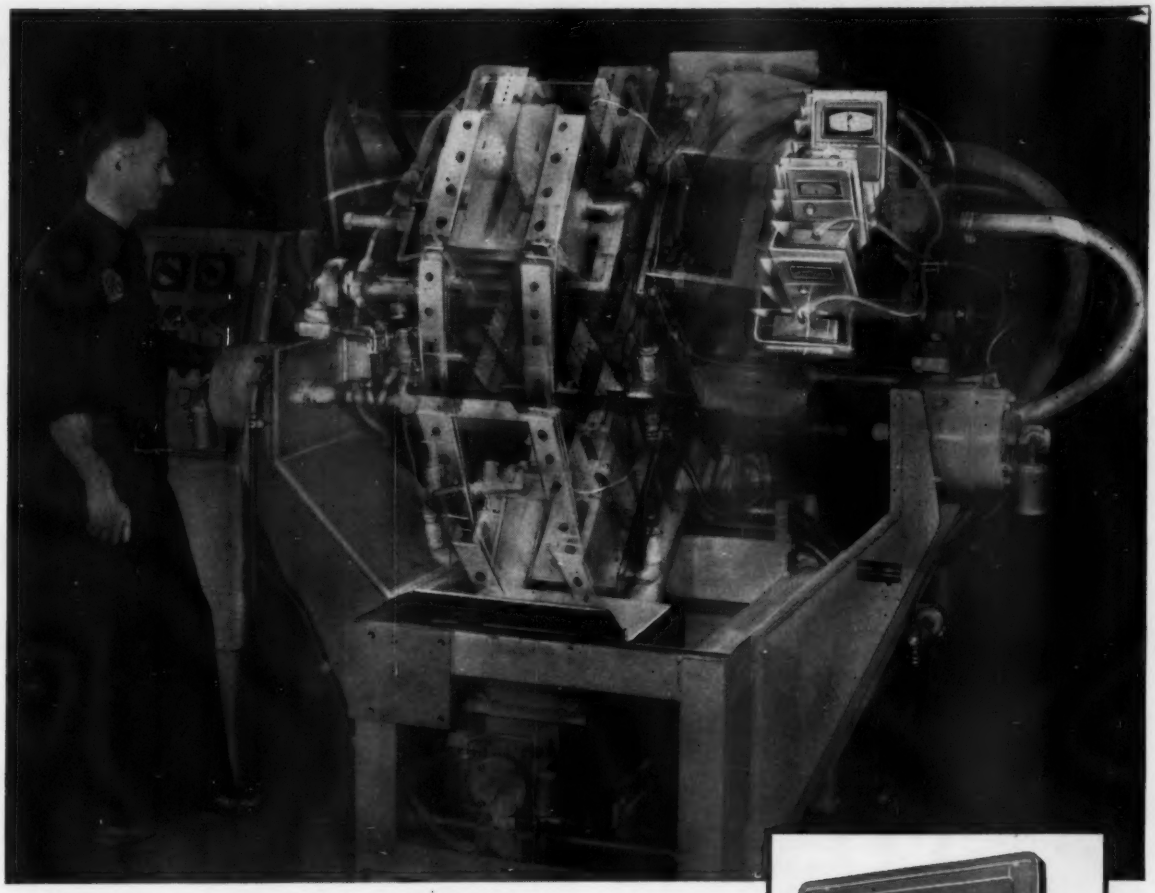
Spin Top Racks are factory assembled racks for mounting motor starters in company's Spin Top enclosures (for hazardous locations). The racks provide for centralized motor control for chemical plants, petroleum refineries and other areas where hazardous material is handled. Various arrangements of starters, such as back-to-



back or two-tier, make the racks adaptable to the installation. Also, circuit breakers, lighting transformers and panel boards can be mounted. Wiring of starters and other electrical equipment is provided to a central junction box, and the rack is delivered wired and assembled. Incoming feeder and load lines are only connections required to complete the installation. The racks can be designed to fit a particular installation, or can be built to users specifications. Of structural steel, they're available welded or bolted. Square D Co.

36—METALLIC LUBRICANT for use on chains

Molub-Alloy 287 Chain Oil is designed specifically for use on chains operating in a temperature range from medium to high. The construction and blend of this lubricant provides ex-



A Partlow Model MFS indicating controller is shown in action in this "multiple exposure" shot of a Holo-Core Automatic Molding Machine manufactured by Spo, Inc., Cleveland, Ohio.

The Temperature Control Built to
SHRUG OFF SHOCK
2438 Times a Day

Every working day, the Partlow Temperature Control in this photo takes between 2400 and 2500 solid "roundhouse punches" from the shell-molding machine to which it is attached.

But despite jarring shock and vibration, and a constant barrage of foundry dust, the Partlow goes right on delivering precision control—without letup or breakdown.

Actually, only a control as simple and rock-solid as the Partlow could withstand this kind of punishment! Because only the Partlow contains no hairsprings, or delicate gadgets.

All Partlow thermal elements of the same range are interchangeable *on the job*, too. There's no time lost waiting for your control to come back from the factory. And you get this extra margin of dependability *without loss of accuracy*. Partlow controls are precise to within 1% of scale in any one of 10 ranges from –30° to 1100° F.

If you use or manufacture equipment within this temperature range, there's a Partlow to fit your application exactly . . . and save you money, too. Available in Pneumatic, Electric or Self-Contained Gas types, in recording, indicating or non-indicating models! To field test any Partlow control . . . or to obtain full details write, The Partlow Corporation, New Hartford, N. Y. Dept. PE-459

Export: Ad. Auriema, Inc., 85 Broad St. New York 4, N. Y.

A complete absence of gadgets and superfluous parts, as seen in this open view of the new MFS indicating control, explains the Partlow's unique ability to function accurately even under the most severe operating conditions.

You can pay more but you can't buy better than

PARTLOW

TEMPERATURE CONTROLS

For more facts circle 604 on Reply Card

Air Conditioning Units Undergoing Test.

96.1%* of plant engineers say...

"our company has benefited from steel-enclosed trolley busways"

Flexible Feedrail systems, in capacities from 60 to 500 amperes, provide convenient movable power sources for cranes and hoists; production, conveyor assembly, and moving test lines; portable and machine tools; cutting and sewing rooms; business machines; lighting; and motor control.

Survey was conducted among 2,036 plant engineers by an impartial organization and printed in a leading trade magazine. Write for free copy of entire survey.

That's not surprising when you think of what Feedrail steel-enclosed trolley busways can do!

Take test line operations, for example. Feedrail delivers power through *overhead mobile outlets that move right along with the product being tested.*

RESULT: work moves smoothly from station to station. No hazardous, dragging cables on floor or conveyor line. Personnel moves about freely and safely. Inspection and maintenance cut to a minimum. Downtime is reduced – production increased!

Whatever test requirement or work flow you set up – there's a Feedrail system to handle it. Surprisingly easy to install, Feedrail can also be easily relocated or extended. And it never becomes obsolete!

Find out how *your plant* can benefit from Feedrail steel-enclosed trolley busways. Send today for Bulletin. Write Dept. P-4.

SOLD BY MORE THAN 1,000 ELECTRICAL DISTRIBUTORS FROM COAST TO COAST

T8

ELECTRIC FEEDRAIL

Never Becomes Obsolete

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company, Inc.

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SPECIALLY QUALIFIED REPRESENTATIVES IN PRINCIPAL CITIES

For more facts circle 605 on Reply Card

NEW PRODUCTS

(Begins on page 170)

cellent penetration, it is said, while resisting temperatures destructive to many oils. Outstanding results are claimed in such applications as drag chains in litho ovens, where factors of slow moving chains, loose tolerance and high temperatures are combined, and on drive chains at high temperatures. Imperial Oil & Grease Co., Inc.

37—ELECTRIC ERASER speeds engineering drafting

Model 3831 is a lightweight electric eraser housed in die-cast aluminum with baked enamel finish. It has a non-slip gripping surface and slight finger

pressure on a switch sets the eraser in operation at 3100 rpm. A safety feature provided is a positive lock chuck to prevent eraser wobble or flyouts. Manufacturer says it is as well adapted to soft pencil erasures as to removing pencilled or inked copy. It can be used with any of five grades of 7-in. erasers. It can also be used for pointing draftsmen's refillable pencils by means of a pencil pointer attachment that fits into the hollow shaft on the back of the machine. Charles Bruning Co., Inc.

38—AIR MOTORS for heavy-duty applications

Five-cylinder, radial air motors in the new Pistonaire line are announced as combining high starting torque and sustained load-lugging ability with a simple throttle valve control that allows instant starts and stops, unlimited reversibility and infinitely variable speeds. Repeated overloads or stalls cannot harm them, says manufacturer, and they operate safely in explosive, damp, hot or corrosive atmospheres.

Ratings range from 11½ to 20 at 90 psi. Direct drive models turn at 400 to 800 rpm at rated horsepower with stall torques from 225 to 162 ft-lb. They are available NEMA D flanged; flanged with 15-in. diam bolt circle; and foot mounted. Weights are 230 to 289 lb. Geared drive foot-

Spotlighting 2 NEW VOGT VALVES

★

FORGED STEEL

INSIDE SCREW

Bolted Bonnet

GENERAL GP PURPOSE

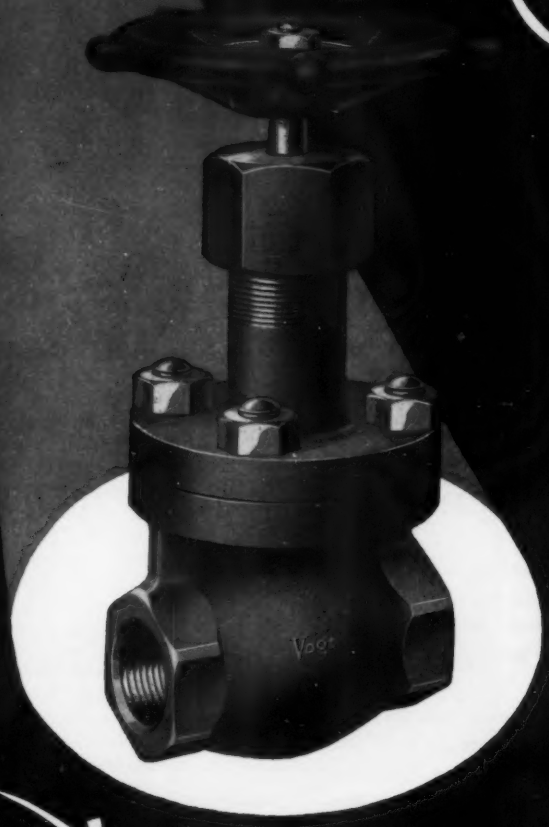
GATE and GLOBE

VALVES

150-800 Pounds Service

2000 Pounds Cold, W.O.G.

Available from stock in
¼" thru 2" sizes and in both
socket weld and screw ends.



CHECK THESE FEATURES

1. Forged steel pressure containing parts designed for light weight and brute strength.
2. Hard faced seats and hardened discs and wedges.
3. Spiral wound stainless steel or Monel gaskets to suit trim.
4. Extra deep stuffing box for long packing life.
5. Dished sure-grip handwheel.

Write for literature Dept. 24A-FP

HENRY VOGT MACHINE CO., LOUISVILLE, KY.

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Vogt

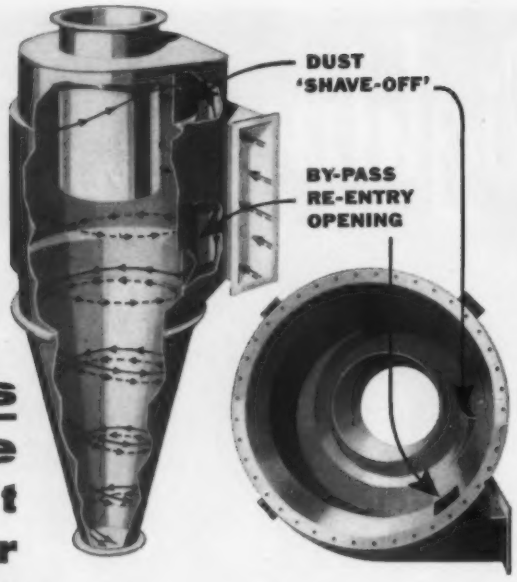
GENERAL GP PURPOSE

Vogt FOR MORE VALVES & FITTINGS

FORGED STEEL

VALVES

For more facts circle 606 on Reply Card

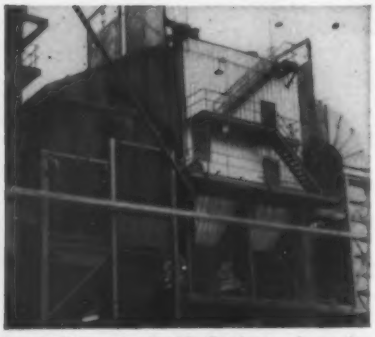


This Cyclone won't clog or plug

Buell's exclusive 'Shave-off' design permits large diameter cyclones that will not clog, plug, or bridge when properly operated: you avoid unnecessary maintenance work or process interruptions.

The unique Shave-off port traps the dust that whirls upward in double-eddy currents, increases cyclone efficiency by eliminating this source of dust reentrainment. Whether installed singly or in groups, Buell Cyclones are the most efficient ever developed.

Other features include extra heavy plate construction for longer service life, Buell-designed manifolds for more efficient, non-turbulent flow of dust-laden gases . . . and the confidence assured by a history of hundreds of installations everywhere in America. Write for a copy of the 12-page booklet, "The Exclusive Buell Cyclone": Dept. 14-D, Buell Engineering Company, Inc., 123 William St., New York 38.



Large-diameter Buell Cyclones in series with Buell 'SF' Electric Precipitator.

buell®

Experts at delivering Extra Efficiency in

DUST COLLECTION SYSTEMS

For more facts circle 607 on Reply Card

NEW PRODUCTS

(Begins on page 170)

mounted models come in five gear reduction ratios from 4.1:1 to 21.5:1. Output shaft ranges from 19 to 200 rpm at rated horsepower, with stall torques of 4837 to 648 ft-lb are announced. Joy Mfg. Co.

39—GATE VALVE fitted with split wedge

Made of Types 316 and J-20 stainless steel alloys suited to a wide range of corrosive conditions, these valves are fitted with a split wedge of ball-and-socket design which automatically adjusts to tapered seating surfaces. The discs, revolving freely in the wedge carrier, produce a self-cleaning action on the seat which is claimed to reduce possibility of galling and seizing. Other features announced are two-piece packing gland design to eliminate binding of follower when gland bolts are tightened unevenly, chevron-type Teflon packing, body of through-port design. Size range of the 150-lb flanged end valve, Fig. 1327, is ½ to 8 in.; of the 200-lb screwed end valve, Fig. 1326, ½ to 2 in. More details are provided in Catalog 59-SS. Jenkins Bros.

40—RUBBER MATTING made of wear-resistant compound

Kleen Sweep All Purpose Matting is made of a wear-resistant rubber compound, reinforced with chopped rayon and nylon fibers, designed for rough-

wear applications. The matting is said to give improved floor protection, safety and noise reduction. And as the name implies, its streamlined design makes it easy to clean and maintain. Ace Rubber Products, Inc.

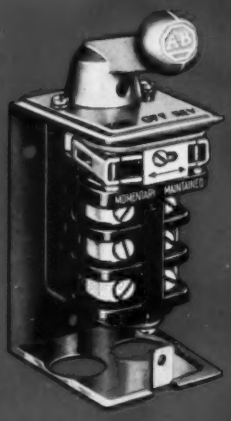
41—EXPANDER DRIVES are air magnetic units

For fast, precision tube rolling, this air-operated magnetically controlled tube expander drives come in two models. In both, rolling action is controlled by a powerful, permanent magnet set to disengage and stop the rolling instantly when preset torque levels are reached. Motors are trigger-

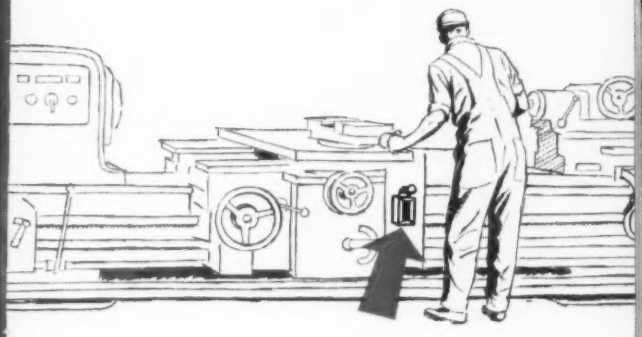
For more facts circle 608 on Reply Card →

ALLEN-BRADLEY

REVERSING DRUM SWITCHES



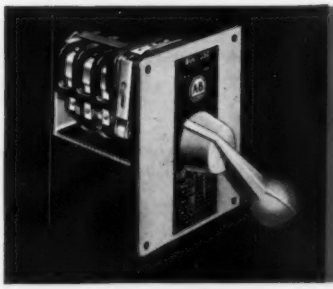
BULLETIN 350
Style A wrap-around cover is removed to show the readily accessible front wiring terminals. Max rating: 2 hp.



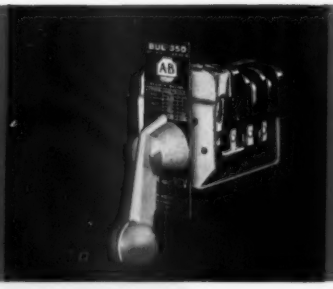
...styled to match the most modern production machines!

Inside and out—this Allen-Bradley drum switch is *all* new. Its trim, modern lines and attractive die-cast aluminum handle will give your production machines "up-to-the-minute" styling.

But there is more than beauty to this new switch. The rugged switch mechanism is a self-contained unit—independent of the enclosure. Misalignment and binding *cannot* occur. The base mounts directly on machine surfaces—without using spacers. And with the wrap-around cover removed, terminal screws are exposed for fast wiring—from the front. Changeover from momentary to maintained contact operation can be made in seconds. Investigate this new "leader" in its field. Send for Publication 6091.



OILTIGHT CAVITY MOUNTING
A-B Style AF reversing switches can be furnished with sealed shaft and rubber-gasketed, oiltight cover for cavity mounting in a machine base.



PANEL MOUNTING
The new Style A switches can be furnished for mounting directly on panels. Nameplate which gives ratings is also included with each switch.

ALLEN-BRADLEY

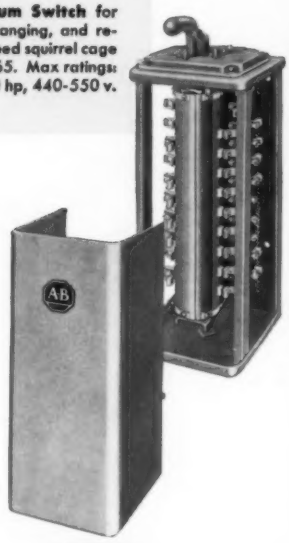
Quality Motor Control

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

3-59-MR

Reversing Drum Switch for across-the-line starting and reversing a-c and d-c motors. Interlocks available. Bulletin 350. Max ratings: A.C. 20 hp, 220v; 40 hp, 440-550v. D.C. 3 hp, 115-230v.

Multi-speed Drum Switch for starting, speed changing, and reversing of multi-speed squirrel cage motors. Bulletin 365. Max ratings: 75 hp, 220 v; 150 hp, 440-550 v.



Speed Regulating Drum Switch for starting and regulating duty of wound-rotor motors. Bulletin 375 non-reversing. Max ratings: 500 hp, 220-440-550 v. Bulletin 385 reversing. Max ratings: 60 hp, 220 v; 75 hp, 440-550 v.

A-B QUALITY

For years of dependable performance

ALLEN-BRADLEY DRUM SWITCHES

have no equal!

These Allen-Bradley drum switches provide simple and economical control for alternating current motors. Although low in cost, these unusually rugged switches are built under Allen-Bradley standards of *quality* . . . your assurance of reliable, trouble free performance. And this broad line of drum switches offers a variety of mounting types, operating handles, and interlocks to satisfy practically every requirement. Let us send you details on this versatile line of drum switches.

ALLEN-BRADLEY

Quality Motor Control

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

3-59-MR

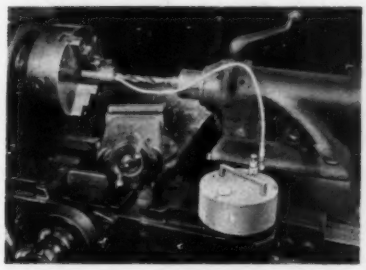
NEW PRODUCTS

(Begins on page 170)

controlled, explosion-proof for use in hazardous locations. The complete control is a single, compact unit designed for easy handling by one operator. The motor runs forward when the trigger is squeezed, reverses when trigger is released. No tools are needed for torque setting. The standard model has a motor speed of 1000 rpm, features maximum torque with pistol-type squeeze trigger, weighs 10 lb, and handles most tube expanding jobs. A heavy-duty model, for jobs requiring higher torque, offers choice of rolling speeds, is controlled by valve handle. It weighs 12½ lb. Expanders are available for tubes ¼ through 3 in. in size. Bulletin Y-53 gives details. Elliott Co.

42—PRESSURE LUBRICATOR has cast iron base

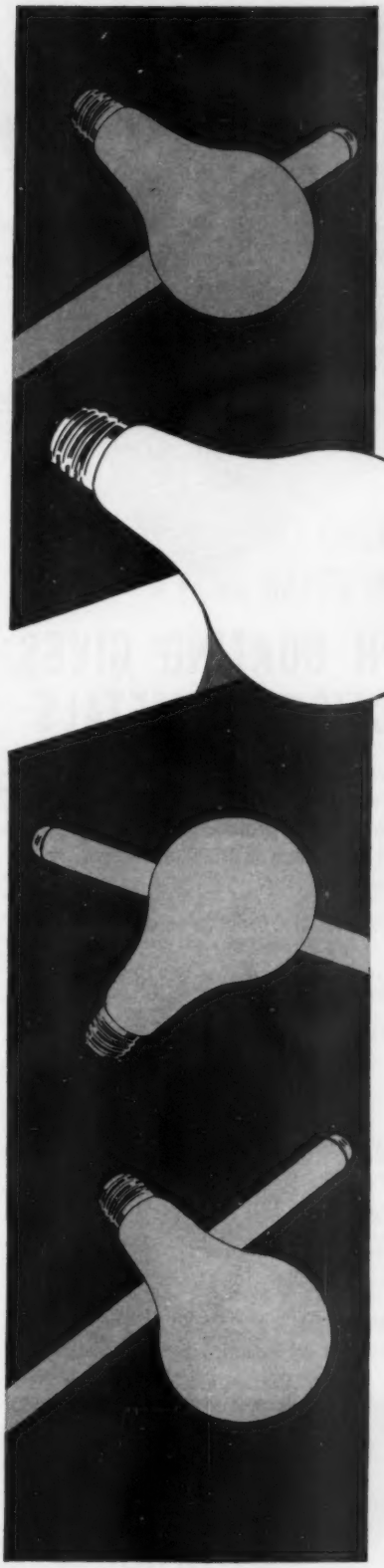
The Squirt, a reservoir type pressure lubricator, was developed for "one touch" cutting tool lubrication. The heavy cast iron base is designed to



keep the lubricator where you want it. A precision oil pump controls amount and pressure of cutting oil flow. The flexible metal hose is positioned to deliver oil right at the cutting edge of tools. Squirt is claimed ideal for supplying oil to tools in drilling and tapping operations; it can shoot oil directly to the cutting edges of drills and taps in lathe work, and in pipe threading jobs the oil is delivered to the dies. C-B Tool Co.

43—SWITCHES designed to deliver peak performance

Super AC Switches—the 15AC1, rated at 15 amp, 120/277 v, and the 20AC1, rated at 20 amp, 120/277 v—operate at full rated capacity for tungsten filament lamp loads, fluorecent installations, and at 80 per cent of switch rating on motor loads, it is announced. According to manufacturer, these switches feature long life, low heat-rise, and heavy silver alloy contacts mounted at the point of least



of the four major brands of lamps

CHAMPION

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VALUE THROUGH UNIFORMITY:

Uniformity in Champion lamps is guarded by over 200 inspections on the more than 3,000 different lamps available to satisfy the diversified lighting needs of factories, stores, homes, office buildings, streets, etc.

MORE THAN 200
CHAMPION LAMP INSPECTIONS

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CHAMPION LAMP WORKS
Lynn, Massachusetts

Your best buy in lamps

For more facts circle 609 on Reply Card

SPECIAL ZINC-RICH COATING GIVES GALVANIC PROTECTION TO METALS

Galvanox is a special coating composed of an extremely high percentage of metallic zinc in an organic binder. The resulting film supplies an electro-chemical type of protection long associated with galvanizing. Applied as a paint, it dries and "cures" to form a very dense coating of metallic zinc.

Galvanox comes ready-mixed in a natural zinc color only and has specialized uses and applications, as:

- For replacing galvanizing
- For reconditioning galvanizing
- For covering arc welds and welding
- For use in conjunction with cathodic protection
- For use as an electrical conductor
- For minimizing electrolysis
- For use as a metal filler
- For underwater, underground or high humidity exposures.

Learn more about the application of Galvanox and its low cost. Write today for a copy of "Galvanox by Subox."

SUBOX PAINTS

Subox Inc.

Established 1924

19 Fairmount Plant, Hackensack, N. J.

Subox Company of Canada, Weston, Toronto 15

For more facts circle 610 on Reply Card

NEW PRODUCTS

(Begins on page 170)

vibration to eliminate arcing and operate more smoothly. They are claimed quieter than many a-c d-c switches. Designed for side or back wiring, these switches accommodate up to No. 10 solid or stranded wire. The 20AC1 features red plastic facing to identify it as a 20-amp switch. Both 15AC1 and 20ACL are of single-pole design. Double-pole, three- and four-way models of each are available. Pass & Seymour, Inc.

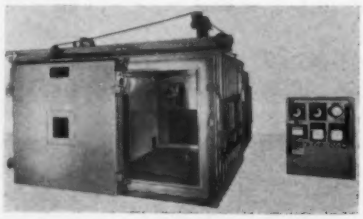
44—MIXING CONCEPT for epoxy resin compounds

Metalset A-3 now comes in a flexurally stronger version that is mixed on a simple one-for-one basis, whether by weight or volume. It is packaged in tubes of identical size—equal weight and volume—to facilitate mixing and reduce waste. The two tubes are in separate but attached containers of the same size, a visual reminder that mixing is done by squeezing equal amounts from tubes. You mix only what you need for the application. Smooth-On Mfg. Co.

Use the Reader Service Cards provided on pages 249-250 to ask for more information on these products. Circle items number of products in which you are interested.

45—TEST CHAMBER has push-button door operation

Designed for ease of operation, this walk-in test chamber has the added advantage of requiring less floor space. The chamber is of such a size (10 by 8 by 12 ft) as to require a door weighing over 3 tons. Yet by suspending it from a trolley and rail, it is



possible to open and close the door simply by pushing a button. The mechanism has automatic stops when either fully closed or open, and when closed is automatically sealed by hydraulic closures, requiring no manual

ECON® DUAL-ELEMENT FUSES

INSTANTANEOUS ACTION ON SHORT CIRCUITS
The fusible links open the circuit immediately when a dangerous short develops. The multiple restricted fusing areas cause the heavier sections to drop out in metallic form completely severing the circuit.
TIMED DELAY ON MOMENTARY OR HARMLESS OVERLOADS
Exclusive Econ Alloy thermal element takes harmless overloads up to 500% . . . gives predetermined delay action to avoid unnecessary and costly fuse blows.
IT'S THE EXCLUSIVE ACTION IN ECON'S SUPER SAFETY ZONE that makes the Important difference
NO INTERMEDIATE PLASTIC STAGE
When an overload exceeds the predetermined heat and time limits, Econ Alloy reacts instantaneously . . . changing directly from solid to liquid. The usual intermediate plastic stage is completely eliminated. Protecting action is fast and complete with Econ's Super Safety Zone.

with the exclusive Super Safety Zone

- STOP NEEDLESS FUSE BLOWS
- MINIMIZE COSTLY DOWNTIME
- ECON SAVES MONEY ON FUSING
- EXTRA PROTECTION AGAINST BURNOUTS

In Econ's Super Safety Zone you'll find an important difference in action . . . a money saving . . . circuit protecting action that spells lowered costs all down the line.

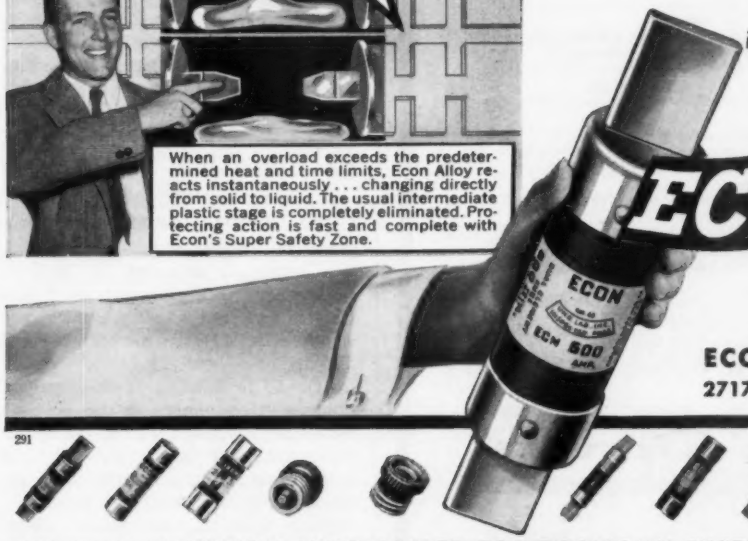
In this Super Safety Zone, harmless or temporary overloads are carried through an exclusive Econ Alloy Element which delays blowing to a predetermined time limit. When overloads exceed the time limit, Econ Alloy breaks the circuit with fast action. This Super Safety feature costs you nothing extra...Another good reason why it's always extra economy to insist on ECONOMY Fuses.

Available in knife blade or ferrule type from 0 to 600 amperes, 250 and 600 volts. Underwriters' Laboratories listed.

Write for ECON Dual-Element Catalog S-60.

it's always extra economy to call for

ECONOMY FUSES



ECONOMY FUSE AND MFG. CO.
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291

ASK YOUR ELECTRICAL WHOLESALER FOR ECONOMY FUSES . . . THE COMPLETE FUSE LINE

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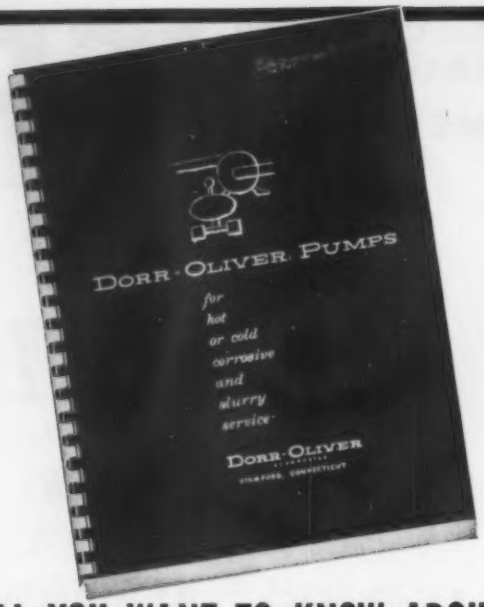

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for corrosive and slurry service

Complete engineering data — dimensions, performance curves, parts lists and specifications on the entire Dorr-Oliver line of alloy metal, lined and diaphragm-type pumps — *all in one big bulletin!* Here's everything you need to solve difficult pumping problems . . . just off the press!

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STAMFORD • CONNECTICUT • U.S.A.

For more facts circle 612 on Reply Card

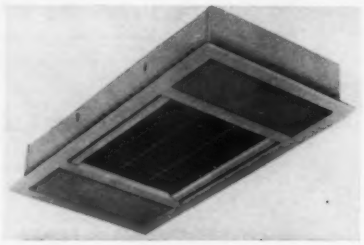
NEW PRODUCTS

(Begins on page 170)

effort. It is possible to lower altitude to ambient and open door from inside chamber. Altitude ranges from ambient to 100,000 ft, temperature from —100 to 300 F., and relative humidity from 20 to 95 per cent. The American Research Corp.

46—CEILING UNIT gives light and radiant heat

Pyrolite RCL is a recessed ceiling unit combining electric radiant heating with built-in lighting. Besides offering economies in space saving and installation costs, it is reported advantageous where floor-to-ceiling window areas make wall installations impractical. Uses include offices, guard

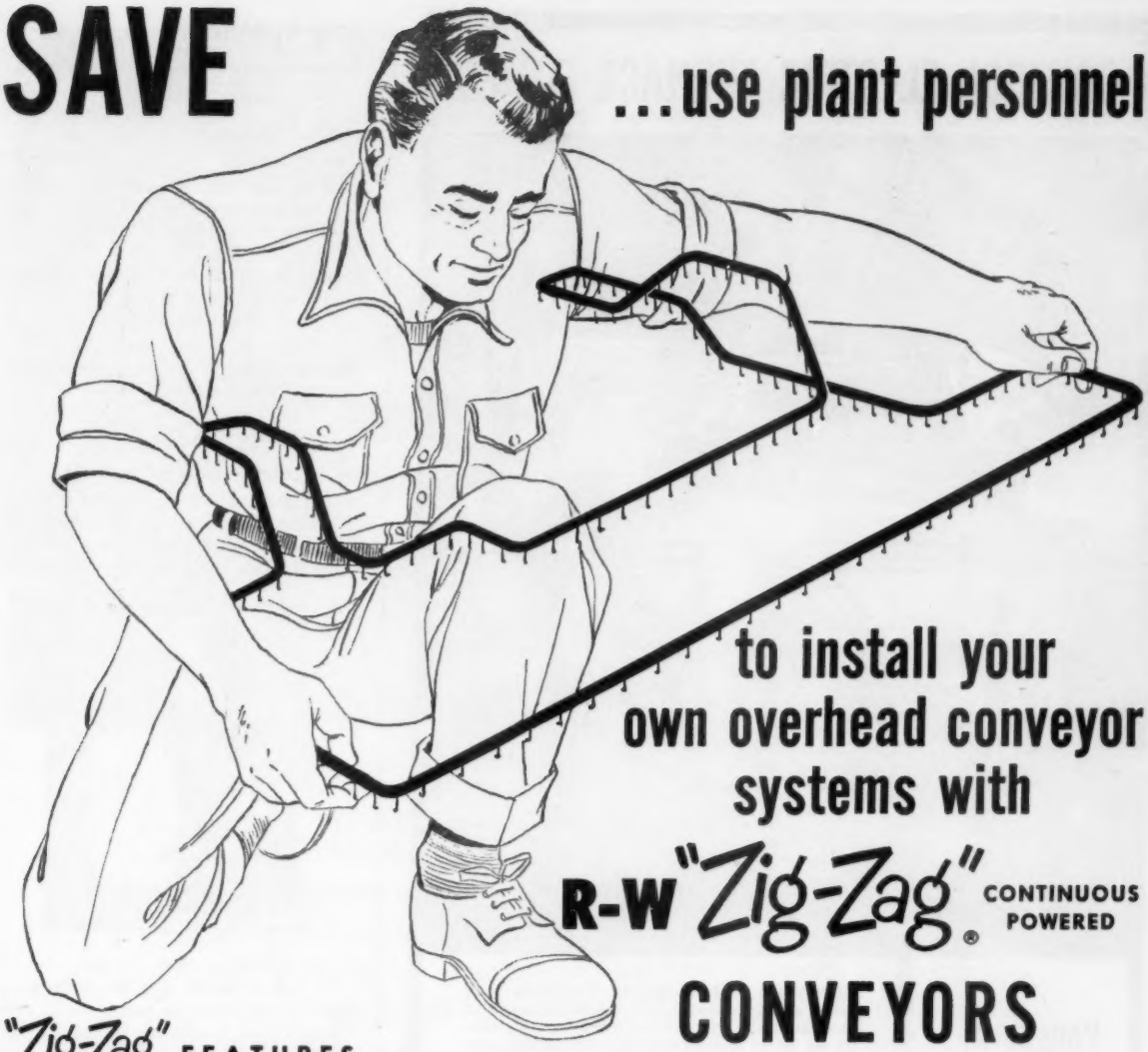


booths, rest rooms. Rated at 1000 w of heating the unit is mildly fan-forced to circulate convection heat normally stacked at the ceiling to all corners of the room. Its heat is described as instantaneous and even and is achieved by tempered Pyrex glass panels having an electrically conductive coating. In typical installations, heating is controlled by a wall-mounted thermostat, lighting by a separate wall switch. Dimensions of the Pyrolite-RCL are 13¾-by-27 in. outside, 12-by-26-by 6¾ in. inside, including junction box. The external frame can have polished chrome or enamel finish. Berko Electric Mfg. Co.

47—LOGGING SYSTEM for new, existing equipment

Called APRIL (automatically programmed remote indication logging), this system is designed for applications where accurate centralized data transmitting and logging systems are required. APRIL can be incorporated as part of a new supervisory system or added to existing installations of company's equipment. It can be used on its own channel, or on the supervisory channel when required. The system can be broadly applied to the pipeline and petroleum industries, electric utilities, commercial buildings, industrial power distribution

SAVE ...use plant personnel



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"Zig-Zag"® FEATURES...

- **FLEXIBLE**... easily moves up, down, in, out and around... will carry unit loads up to 125 lbs. at speeds from one inch to 100 feet per minute. Easily installed in any plant.
- **SAFE**... all moving parts of the chain are fully enclosed and protected from dirt, dust, etc.
- **STRONG**... a continuous chain of alternate horizontal and vertical wheel units travel through a rugged steel track.
- **EFFICIENT**... designed, manufactured and backed by the leading firm in this field for over 75 years... Richards-Wilcox.

R-W also manufactures other top-quality overhead conveyor systems to meet the rugged demands of industrial and commercial use. This line includes:

- R-W "TWIN-TRAK" OVERHEAD AUTOMATIC DISPATCH SYSTEMS... CATALOG NO. F-192.
- R-W "TRU-TRED" MONORAIL CONVEYORS... CATALOG NO. A-64.
- R-W "SAFE-RAIL" CONVEYOR EQUIPMENT... CATALOG NO. A-94-R.

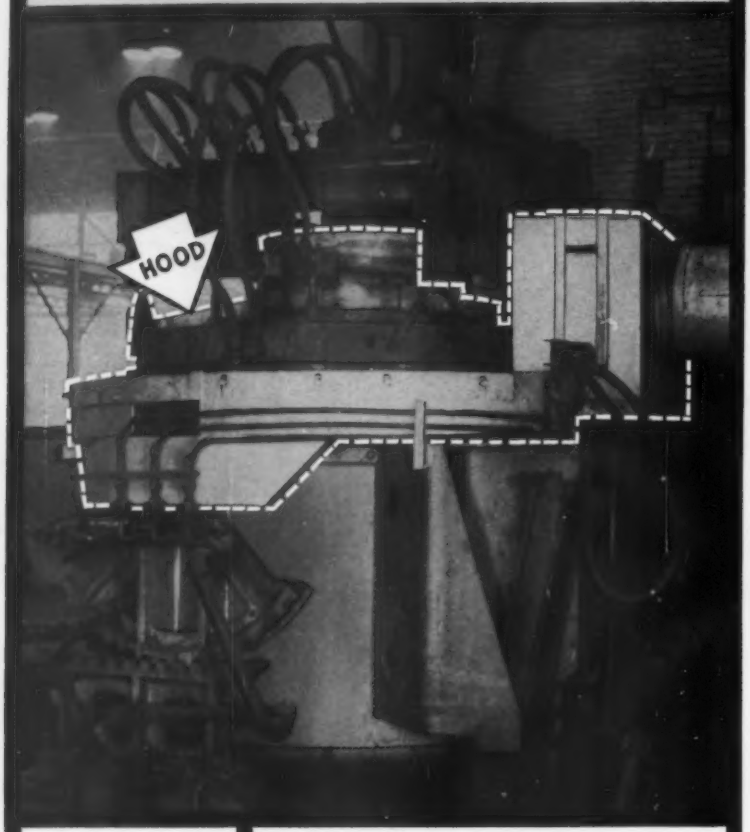
It is easy to do... in fact it is much like "building with blocks". You merely take so many standard R-W "Zig-Zag" conveyor components and put them together into a *custom* conveyor system to meet your exact requirements. *It is economical*—for you can use your own plant personnel to "self-assemble" and install an R-W "Zig-Zag" Conveyor. If you need assistance, there is an R-W Sales-Engineer near by to serve you. Expansion can easily be accomplished at a later date... again by using standard "Zig-Zag" components and your plant personnel to "add on" to the original system. SAVE with R-W "Zig-Zag" Conveyors... they are economical to purchase... economical to install... and economical to maintain. Ideal for small or very large installations. Naturally we will engineer and install a "Zig-Zag" system if you so desire. Write today... request Catalog No. A-93R.

R W

Richards-Wilcox
MANUFACTURING COMPANY
MATERIAL HANDLING DIVISION
460 W. THIRD ST. • AURORA, ILL. • Branches in all principal cities

For more facts circle 613 on Reply Card

CONTROL ELECTRIC FURNACE FUMES



Pangborn offers a new concept in electric furnace exhaust hoods!

After years of development, Pangborn now offers effective control of smoke, fumes and dust from electric melting furnaces with minimum interference to furnace operations and maintenance. The hood design is based on the fundamental dust control principle of confining and capturing fumes and dust immediately adjacent the source. Effective control is secured with substantially reduced exhaust air volumes.

The Pangborn Exhaust Hood reduces the weight carried by the furnace roof; reduces hood areas subject to high temperatures; reduces electrode travel limitations and is applicable to top and side charge furnaces of all types and sizes.

With the exhaust hood connected to an efficient Pangborn Cloth Bag Collector, compliance with the most rigid air pollution control regulations is assured. For information call the Pangborn man in your area or write: PANGBORN CORP., 3200 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

Pangborn CONTROLS DUST

For more facts circle 614 on Reply Card

NEW PRODUCTS

(Begins on page 170)

systems. Claimed more accurate than previously available equipment, APRIL converts analog-type quantities to a binary code form and transmits the information from a remote location, by means similar to that used in manufacturer's standard supervisory equipment. When received at a master station, the code is converted to decimal form for visual display or logging using an electric typewriter. General Electric Co.

48—PLASTIC HOLDER for cards "on the move"

This plastic holder is designed to keep tabulating cards in place during assembly or production operations as work travels from station to station.

Eight riveted eyelets are provided so that travel holder can be hung by a hook, thin wire or cord as it goes along. Thus it can be affixed to jigs, fixtures, or units traveling on conveyor belts. Model 550S accommodates 75 standard cards and Model 500S, 150 cards. Cowan Boyden Corp.

49—DRY MIXTURE pickles base metals, strip chrome

Pickelene 300 is announced as producing a bright, smut-free surface and as giving off no objectionable fumes. The dry mixture is formulated to pickle all base metals and also strip chromium. It includes acid salts, activators, and surface active agents. An aqueous solution may be used as an activating acid dip prior to plating on steel, brass, copper, or zinc die castings, or as a pickle for removal of rust, heat treat scale, oxides, and residues of brazing flux from steel. Most operations using Pickelene 300 may be performed in lead, Koroseal, or rubber tanks, but manufacturer recommends lead if operating temperature is to exceed 180 F. Heating coils may be lead or Karbate.

"Higher Education... Our Greatest Tool"

OSCAR G. MAYER
Chairman, Oscar Mayer & Co.

"During the last twenty years we have had dramatic evidence of what massive research can accomplish. Every thinking American today is acutely aware that our future welfare depends upon this vital activity.

"But sound higher education is the prerequisite of good research; it is vitally important that our higher education be constantly improved, beginning with our secondary schools. Higher education is the only means with which we can mine our most valuable natural resource: the creativity of the human mind in all fields, social and cultural as well as scientific.

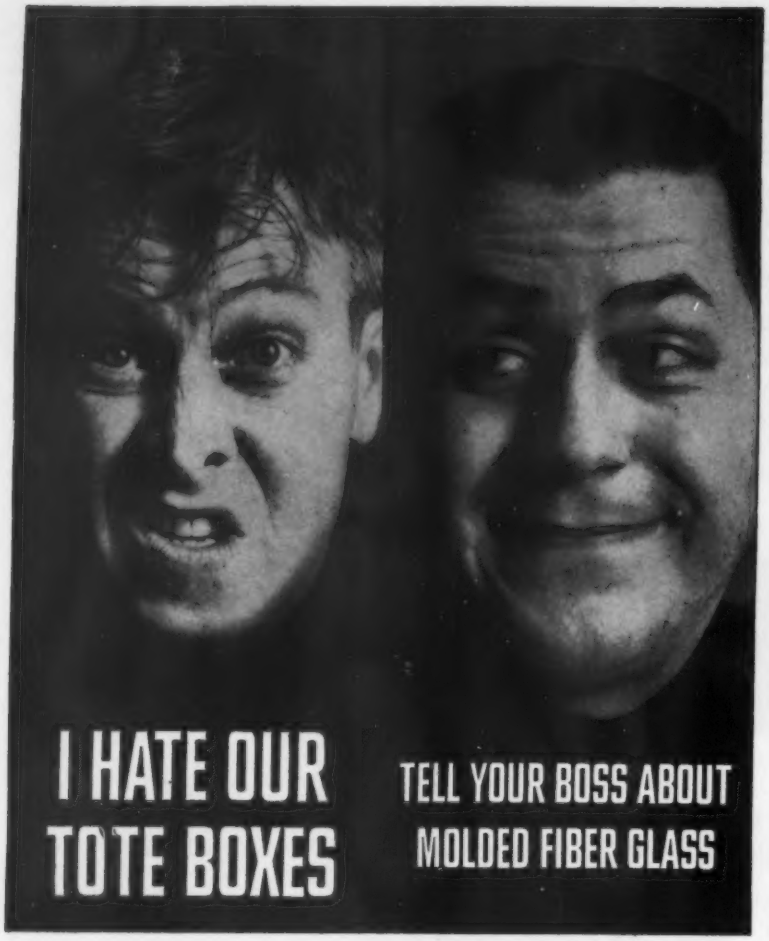
"By supporting the college of your choice in its efforts to provide the best possible faculty and physical facilities, you are investing in the one tool with which to shape favorably the future of America."

If you want more information on the problems faced by higher education, write to: Council for Financial Aid to Education, Inc., 6 E. 45th Street, New York 17, N. Y.

Sponsored as a public service, in cooperation with the Council for Financial Aid to Education

HIGHER EDUCATION
KEEP IT BRIGHT

ADVERTISING COUNCIL · PUBLIC SERVICE ·



Yesterday again I cut my finger on a torn edge. And last week I had to scrap nine of them! . . . too many dents and bent sides. Boy, what I'd give for a box that would last at least a year . . . and wouldn't weigh a ton! Brother, I hate our tote boxes!

Tell him that now there are tote boxes that can't crack, can't rust, and can't tear at the edges. They're made of molded fiber glass, that's why . . . with wire reinforced edges. They're so strong you can jump on 'em without making a dent . . . but still real light to lift! Molded fiber glass, that's the ticket in a tote box. Saves lots of money.

No Maintenance • No Repainting • No Repairing, with "TOTELINE" TOTEBOXES of MOLDED FIBER GLASS

- Hold shape indefinitely
- Featherlight—but tough
- Heat-proof, chemical proof
- Clean easily • Seamless
- Stack conveniently
- Many sizes—many colors

TOTELINE

MOLDED FIBER GLASS TRAY COMPANY

LINESVILLE, PA. Offices in principal cities and Canada MF-59-01

WORLD'S LARGEST PRODUCER OF REINFORCED PLASTIC TRAYS AND TOTE BOXES

For more facts circle 616 on Reply Card

NEW PRODUCTS

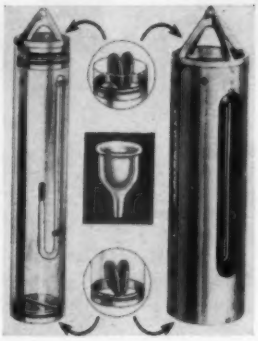
(Begins on page 170)

Concentration of solution varies from 4 to 32 oz per gallon. Hanson-Van-Winkle-Munning Co.

50—SAMPLING BOB for more accurate analysis

This sampling bob is designed for taking more accurate and more undisturbed samples of liquids held in bulk storage, barge or marine tanks—than formerly possible, resulting in increased accuracy of octane and volatility analyses. The bobs are reported suited for use with conservation sampling equipment. They come with clear plastic cylinders for sampling light products having low viscosities, and with brass cylinders for heavier, high viscosity products, those to 200 F.

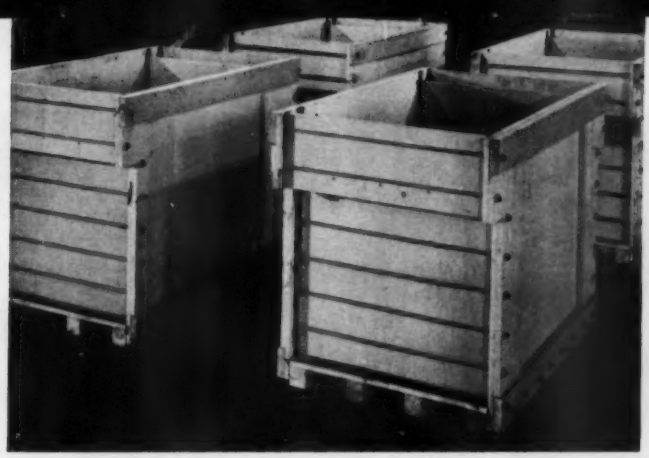
The two ends of the cylinder incorporate sensitive butterfly wing valves,



which open wide as the bob is lowered into the product. When the downward movement is stopped, both upper and lower valves close automatically, trapping in the cylinder an undisturbed sample of the material from that level in the tank. Raising the bob causes both valves to close, retaining the sample. A hole in the side of the cylinder above the top valve permits any product caught on the top of the valve to drain off when the bob is raised out of the liquid. The thermometer inside the cylinder is U shaped, so the bulb is in the center and immersed in the liquid sample for accurate temperature reading. Bobs come in four sizes from 1/5 qt to 2 qt. Oceco Div., The Johnston & Jennings Co.

51—PLASTIC MORTAR for masonry protection

Sta-Flex Plastic Mortar is designed to give permanent protection to stucco, brick, concrete, stone, cinder block, cement blocks, cement plank, asbestos siding, unglazed tile, and wood. Ac-



TANKS of GPX are easily constructed, do not leak or corrode. Resistant to hydrocarbon, salt, soap, hydrochloric and sulphuric solutions, organic solvents, many others.

GPX® plastic-faced plywood solves your special problems!

Armor-hard high density plastic overlay is fused to high-grade exterior plywood. Tough *GEORGIA—PACIFIC* **GPX** resists abrasion, chemicals, extreme temperatures, surface checking.

PALLETS, bins, chutes wear longer when made of GPX! Up to 30 times the abrasion resistance of unprotected plywood!

RE-USABLE CRATES of GPX for critical storage or handling. The smooth, tough, plastic face protects against moisture, extreme temperatures, corrosives and contamination. Dimensionally stable. Requires no painting.

Standard thicknesses and panel sizes. Special sizes on order. Call your local G-P source or write for sample and specifications to Georgia-Pacific, Dept. PE459, Equitable Bldg., Portland, Ore.

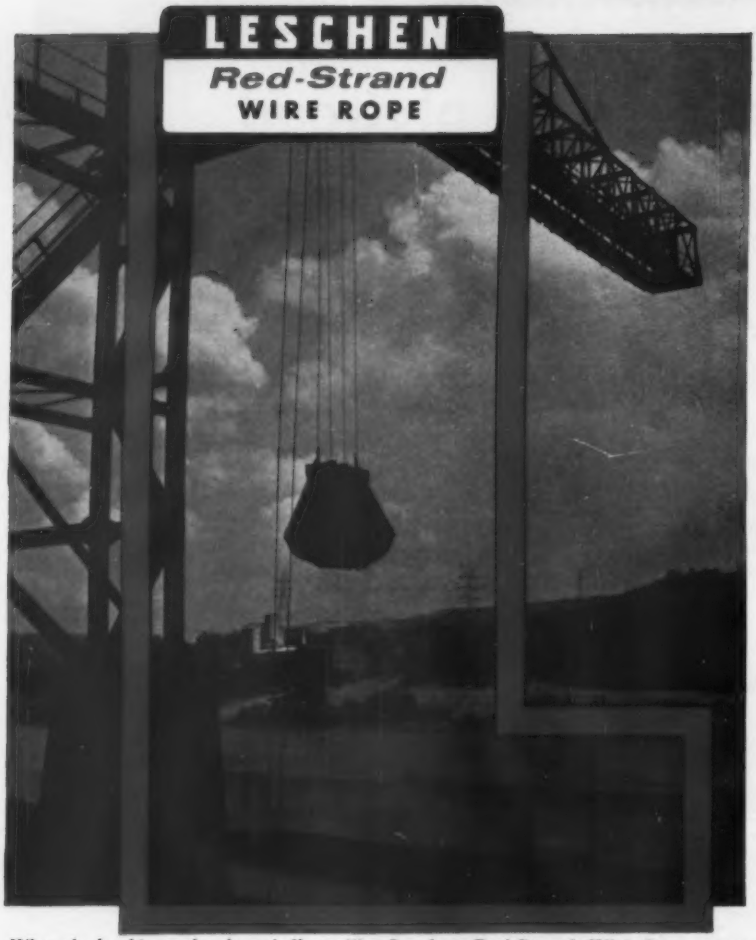
GEORGIA—PACIFIC

Plywood & Redwood
Lumber & Hardboard
Pulp & Paper

For more facts circle 617 on Reply Card

when the going gets rough-

give 'em "L"



When the load is on the clam shell, you'll be glad you rigged with *Leschen*—the wire rope that's the same top quality in every foot of every reel. The new Leschen wire mill is designed to deliver exactly that. New machines . . . new processes . . . exclusive new continuous-flow technique—all as modern as tomorrow. Try Leschen Red-Strand Wire Rope now and see how its uniform quality makes your operation safer, your replacement time farther in the future. Make your next order Leschen! *Leschen Wire Rope Division, H. K. Porter Company, Inc., St. Louis 12, Mo.*

LESCHEN WIRE PORTER ROPE DIVISION

H.K. PORTER COMPANY, INC.

DIVISIONS: Connors Steel, Delta-Star Electric, Disston, Forge & Fittings, Leschen Wire Rope, Mouldings, National Electric, Refractories, Riverside-Alloy Metal, Thermoid, Vulcan-Kidd Steel, H. K. Porter Company (Canada) Ltd.

For more facts circle 618 on Reply Card

NEW PRODUCTS

(Begins on page 170)

cording to manufacturer, it renovates, waterproofs, preserves, protects and decorates, and it meets the need for densifying and waterproofing concrete and masonry and yet permits the structure to breathe. The material may also be used for sealing cracks and joints against hydrostatic pressures. It comes in brush, trowel, clear and plastic bond types. Gunite Restoration Co., Inc.

52—CLOSED CIRCUIT TV, moderately priced system

Reportedly priced well below most custom-designed systems, this one is expected to stimulate greater industrial use of closed circuit television. The camera used is a vidicon-type unit weighing only 15 lb. It requires no special lighting and transmits an image on channels 2 through 6 to standard, home-type receiver. This camera has a turret mount for three lenses but may be sold with one, two or three lenses, as required. According to manufacturer, this TV system is not designed for special applications requiring custom installations—but is intended to meet the high percentage which can utilize standard equipment, mass-produced and moderately priced. Sylvania Home Electronics, Div., Sylvania Electric Products Inc.

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 249-250. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

53—COUNTER, high speed, has plug-in unit

Reliable industrial counting at speeds over 1500 a minute are reported with Robot-Eye RE-8 Photo Electronic Counter. It counts by interrupted or reflected light beam. There is no physical contact with objects being counted. The instrument embodies a six-digit plug-in counter which has a life of over 100,000,000 counts, company points out, and the replacement counter simply plugs in. Counter rests to zero at a touch of a button. Robot-Eye RE-8 consists of three compact units: an amplifier counter, which may be remotely mounted, and photocell and light source which are swivel-mounted for easy installation and

when the pressure is on you need PEN-O-LED® EP

When production is up, a breakdown can be dangerously costly. Maintenance costs compounded with lost orders add up big in the profit squeeze. That's why in important places—such as gear drives subject to high pressures—you need Pen-O-Led EP, for protection against wear and costly down-time.

Pen-O-Led lubricants' extreme pressure and oiliness additives give you positive protection against friction and film rupture under the highest load conditions. They provide an ample margin of protection under shock loads, periods of peak overloads, and help prevent welding of gear teeth. Pen-O-Led EP is available in eight job-matched viscosity grades for gears, plain and anti-friction bearings, speed reducers, worm gears, screwdowns . . . wherever working loads exceed 1000 lbs. per lineal inch of gear tooth face.

For longer service life and lower maintenance costs—specify Pen-O-Led EP. For more information, call your nearest Esso office, or write: Industrial Lubricants Division, Esso Standard Oil Company, 15 West 51st Street, New York 19, New York.

Esso

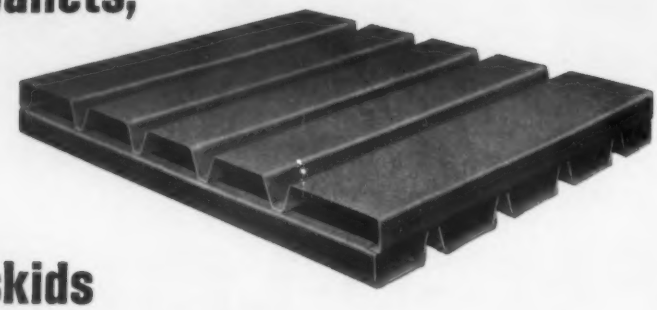
In Industry after Industry..."ESSO RESEARCH works wonders with oil"

For more facts circle 619 on Reply Card

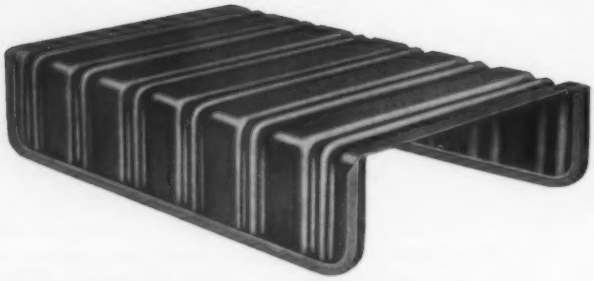
LOOK TO UNION METAL

for boxes,

pallets,



skids



Detailed information covering advantages, features and complete range of designs is readily available.

THE UNION METAL MANUFACTURING COMPANY
Canton 5, Ohio • Brampton, Ontario

UNION METAL
Material Handling Equipment

For more facts circle 620 on Reply Card

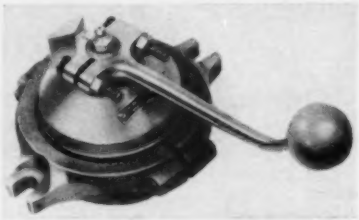
NEW PRODUCTS

(Begins on page 170)

alignment. Photo cell and light source can be as far as 10 ft apart. Robot-Eye RE-8 costs around $110.00. Standard Instrument Corp.

54—CONTROL VALVE features precise throttling

Model 300 is a multi-port, three- and four-way flat-disc type control valve. It actuates single- or double-acting cylinders and may be used with air, water, hydraulic fluid or oil as the pressure medium at operating pressures of 300 psi. This valve is described as low priced and providing accurate, repeatable control of presses, hoists, gates, doors, lifts, clutches, brakes etc. It features simplified control settings in which bumper screws on the operating lever are turned until desired piston speed is achieved, then are locked in place with hex nuts. Trapezoid-shaped ports on valve base and disc allow modulated throttling. Model comes in three pattern sizes covering five standard pipe sizes from ¼ to 1 in. W. H. Nicholson and Co.



55—SOLVENT for cleaning and rust prevention

This rust-preventing solvent for cleaning industrial machines and metals is introduced as a companion product to company's gun cleaning solvent, known for success in removing primer, lead, metal fouling etc. The industrial formulation is suggested for such applications as protection of textile needles against humidity and sweating and the cleaning of dirt, gum, size, crust, lint and oily deposits from machinery. The solvent may be applied by brush and is claimed not to injure cotton, wool, silk or synthetic yarns Frank A. Hoppe, Inc.

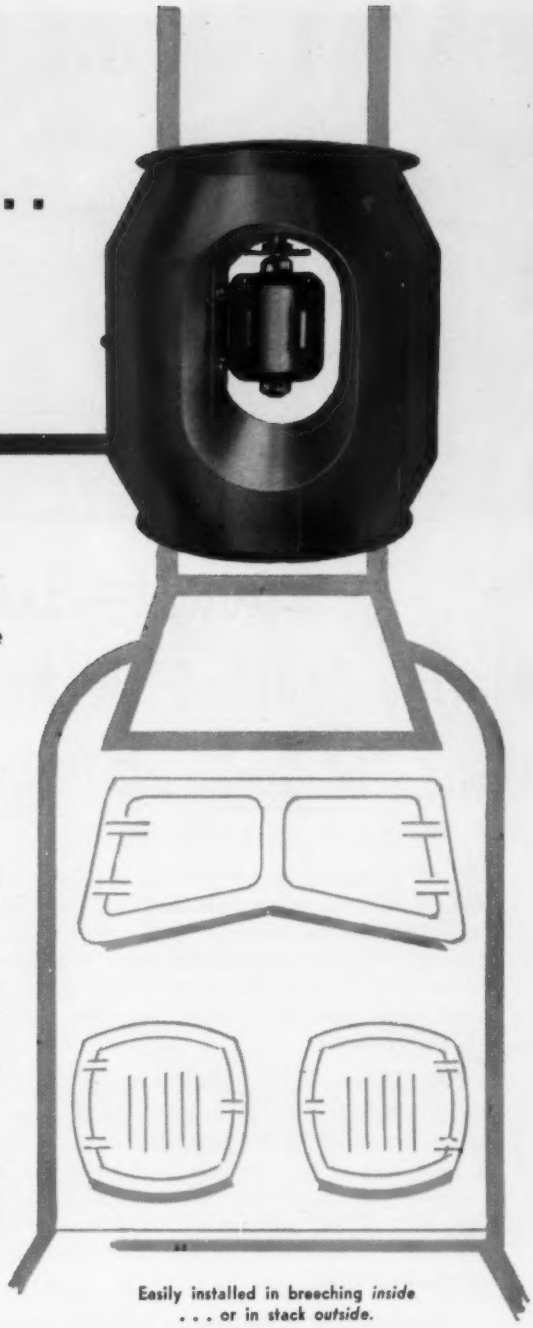
56—REFRACTORY fills the problem-size voids

Thermastic Super Mastic Cement is introduced for filling voids too large for mortar and too small to "key in" regular castables, plastics or ramming

From full speed to 50% reduction...

draft keeps pace with boiler needs

11-step controller for single-phase motors. 9-step model for 3-phase motors also available.



Easily installed in breeching *inside* . . . or in stack *outside*.

Located anywhere in the boiler room, motor speed controllers for DeBothezat Induced Draft Bifurcator® Fans permit *complete draft flexibility*.

As draft requirements vary during starting and fluctuating loads, fan speed can be adjusted for optimum boiler performance.

DEPENDABLE . . . COMPACT Direct motor drive eliminates belts. Motor is completely isolated from fumes and heat. This results in such dependable performance, these DeBothezat units are widely used in unattended radio-TV relay towers and pipeline stations.

DeBothezat Induced Draft Bifurcators are available for high pressure boilers delivering up to 60,000 pounds of steam per hour and low pressure boilers delivering up to 190,000 EDR.

FOR FURTHER INFORMATION
SEE OUR CATALOG IN
SWEET'S
PLANT ENGINEERING FILE
OR WRITE FOR COPY

De Bothezat™ FANS

A DIVISION OF

American Machine and Metals, Inc.

EAST MOLINE, ILLINOIS

IN CANADA: Represented by DOUGLAS ENGINEERING CO., LTD., Toronto • Montreal

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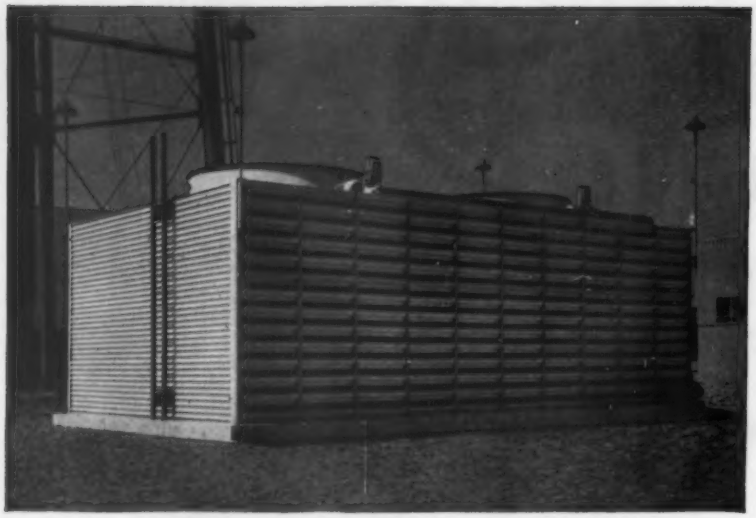


How foresight—and a

Marley Double-Flow Aquatower®

turned "Hot Spots" into Profit Areas...

At a glance, water cooling requirements for this new plant do not appear substantial . . . but the planning team considered all the isolated "hot spots" that called for water cooling. A little refrigeration here, a little air conditioning there, some furnace doors and welding equipment in other areas—put them all together, and they added up to water-well-worth-saving.

That's why the foresighted plant designers put a Marley Double-Flow Aquatower in the original plans. This compact, easy-to-locate cooling tower, designed for flexible operation, could handle *all* the plant's varied water cooling requirements —dependably, economically, permanently. By saving more than 95% of the cooling water required, the tower would soon pay many times over its modest original cost, and return handsome profits.

Double-Flow Aquatower's flexibility offers the same advantages in plants where small water cooling requirements have multiplied with expanded plant activities. Look around . . . and if you see water being wasted for air conditioning, refrigeration, process cooling, quenching operations, air compressors, welding equipment, molding presses, etc., call your nearby Marley Engineer or write today to

MARLEY

The Marley Company

Kansas City, Mo.

For more facts circle 622 on Reply Card

NEW PRODUCTS

(Begins on page 170)

mixes. According to manufacturer, this product's super bonding strength prevents cracking and voids that allow furnace gases to attack outer steel furnace casing. It is claimed resistant to abrasion typical in boilers, incinerators and other heating units. Thermastic Super is described as a wet air-setting, paste-like, trowelable, mastic cement. It adheres to metal surfaces. Company says it remains workable longer than regular mastic cements but dries in half the time. Maximum use is up to 3000 F. J. H. France Refractories.

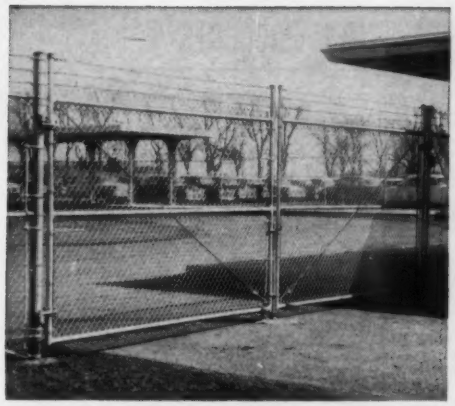
57—POLYMER LININGS for use with wood tanks

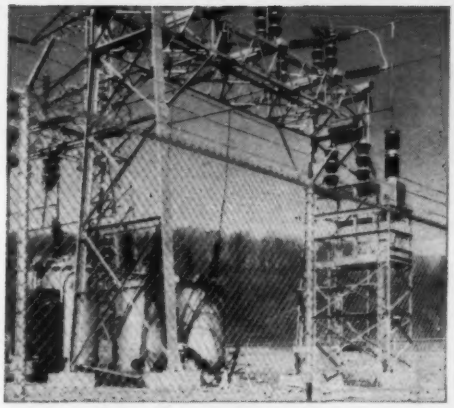
These linings are available in such polymers as polyvinyl chloride for handling most inorganic acids and bases and many organic solvents, and in polyethylene for organic solvents and inorganic solutions. Wood tanks with polymer linings are claimed to offer worthwhile savings in both labor and material costs compared with many tank and lining combinations. The custom-made polymer linings are heat

sealed into a bag liner made to fit the inside of the tank. They can be furnished for round or rectangular tanks, new or in use. A convenient method of installation is to apply the liner loose in the tank and fasten it to wood around the top, or carry the liner over the top and fasten outside. Where necessary, lining can be cemented to tank. Fittings are connected to the tank with the liner in place. In some cases it is possible to use plain steel or galvanized fittings with a sleeve made of the tank lining running through the fitting. Wendnagel & Co., Inc.

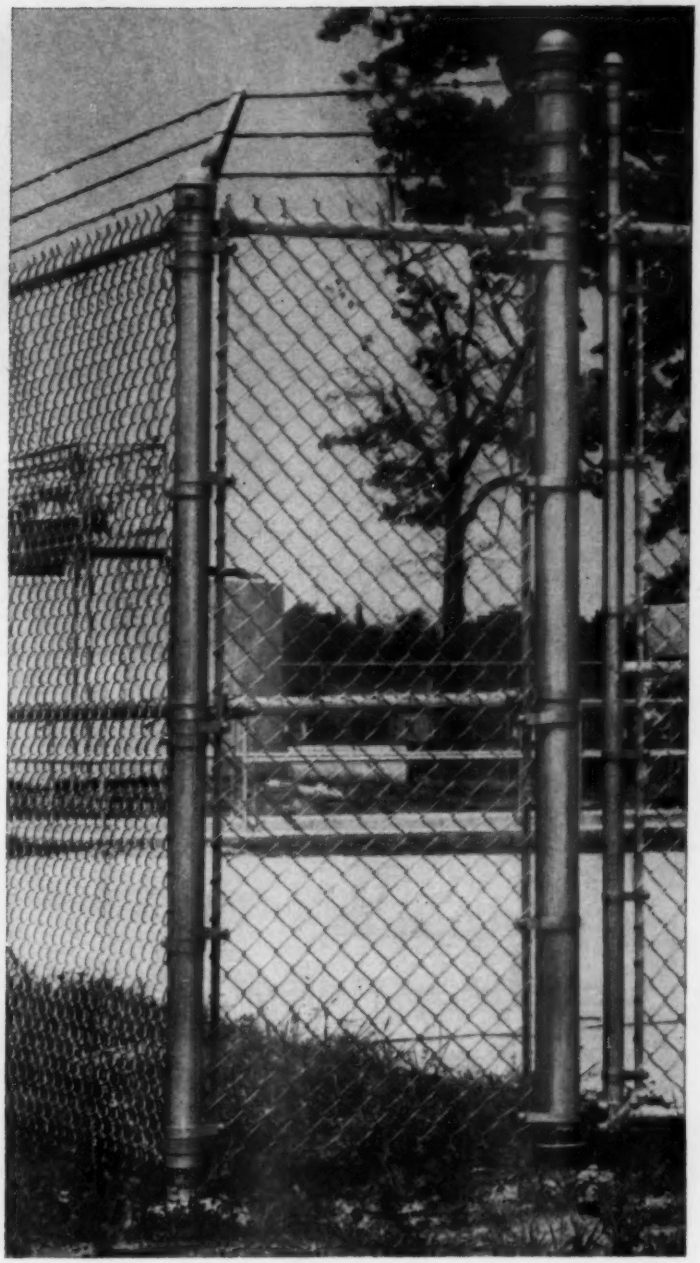
58—UNIT HEATER CONTROL is small, compact unit

Type CUH Combination Unit Heater Control, described as the smallest device of its type, combines in one enclosure a number of accessories. All equipment is mounted on the remov-





with Aluminum THIS FENCE IS MAINTENANCE-FREE!



Chain Link Fencing of Alcoa Aluminum Needs No Protective Painting

Because aluminum supplies its own protection against highly corrosive industrial elements, applications throughout the years have proven advantages more than skin deep. Alcoa® Aluminum alloys age to a pleasing shade of gray and need no painting to preserve appearance or strength.

The superior combination of durability and appearance in chain link fencing of Alcoa Aluminum is evidenced in installations over 30 years old. Alcoa Aluminum consistently outlasts conventional installations . . . with an absence of maintenance cost.

Check these other advantages you get with Alcoa Aluminum:

High Strength—Average tensile strength of Alcoa's new alloy is 57,500 psi.

Easy Erection—Light weight means less labor.

Readily Available—Reliable manufacturers and erectors in 48 states. Contact your nearest Alcoa sales office.

For your copy of 12-page illustrated booklet and a summary of recently bid prices on 4-ft-high and 6-ft-high all-aluminum fencing, write to Aluminum Company of America, 2057-D Alcoa Building, Pittsburgh 19, Pa.

ALCOA ALUMINUM

Your Guide to the Best in Aluminum Value

For Exciting Drama Watch "Alcoa Theatre," Alternate Mondays, NBC-TV, and "Alcoa Presents," Every Tuesday, ABC-TV

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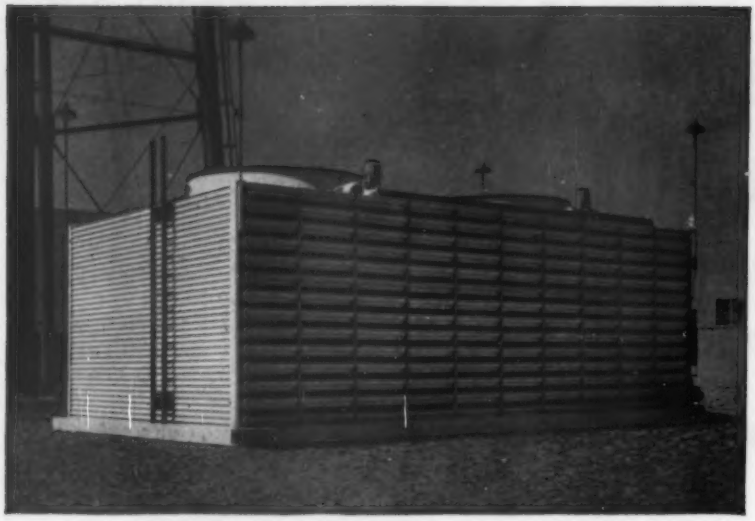

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MARLEY

The Marley Company

Kansas City, Mo.

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NEW PRODUCTS

(Begins on page 170)

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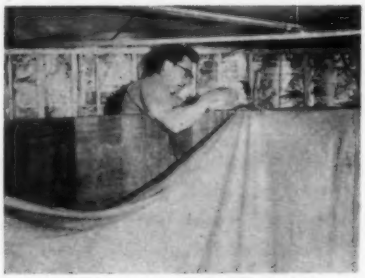
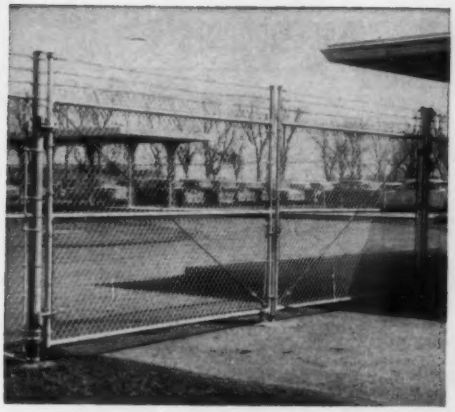
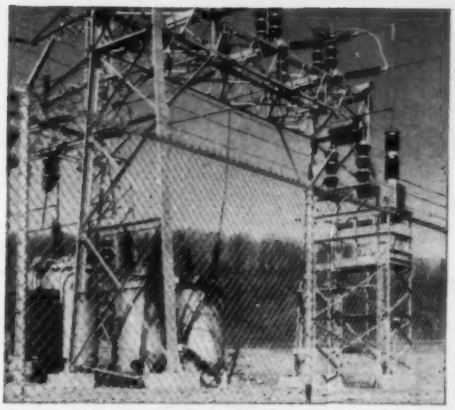


sealed into a bag liner made to fit the inside of the tank. They can be furnished for round or rectangular tanks, new or in use. A convenient method of installation is to apply the liner loose in the tank and fasten it to wood around the top, or carry the liner over the top and fasten outside. Where necessary, lining can be cemented to tank. Fittings are connected to the tank with the liner in place. In some cases it is possible to use plain steel or galvanized fittings with a sleeve made of the tank lining running through the fitting. Wendnagel & Co., Inc.

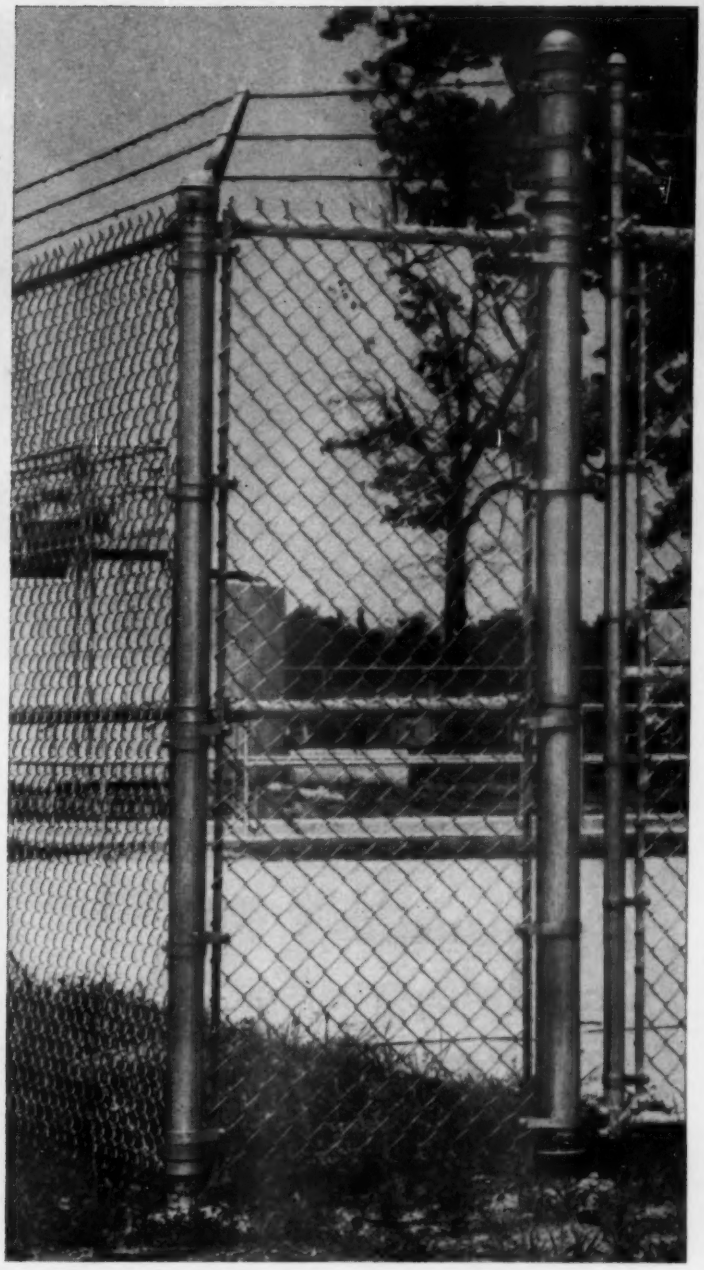
58—UNIT HEATER CONTROL is small, compact unit

Type CUH Combination Unit Heater Control, described as the smallest device of its type, combines in one enclosure a number of accessories. All equipment is mounted on the remov-





with Aluminum THIS FENCE IS MAINTENANCE-FREE!



Chain Link Fencing of Alcoa Aluminum Needs No Protective Painting

Because aluminum supplies its own protection against highly corrosive industrial elements, applications throughout the years have proven advantages more than skin deep. Alcoa® Aluminum alloys age to a pleasing shade of gray and need no painting to preserve appearance or strength.

The superior combination of durability and appearance in chain link fencing of Alcoa Aluminum is evidenced in installations over 30 years old. Alcoa Aluminum consistently outlasts conventional installations . . . with an absence of maintenance cost.

Check these other advantages you get with Alcoa Aluminum:

High Strength—Average tensile strength of Alcoa's new alloy is 57,500 psi.

Easy Erection—Light weight means less labor.

Readily Available—Reliable manufacturers and erectors in 48 states. Contact your nearest Alcoa sales office.

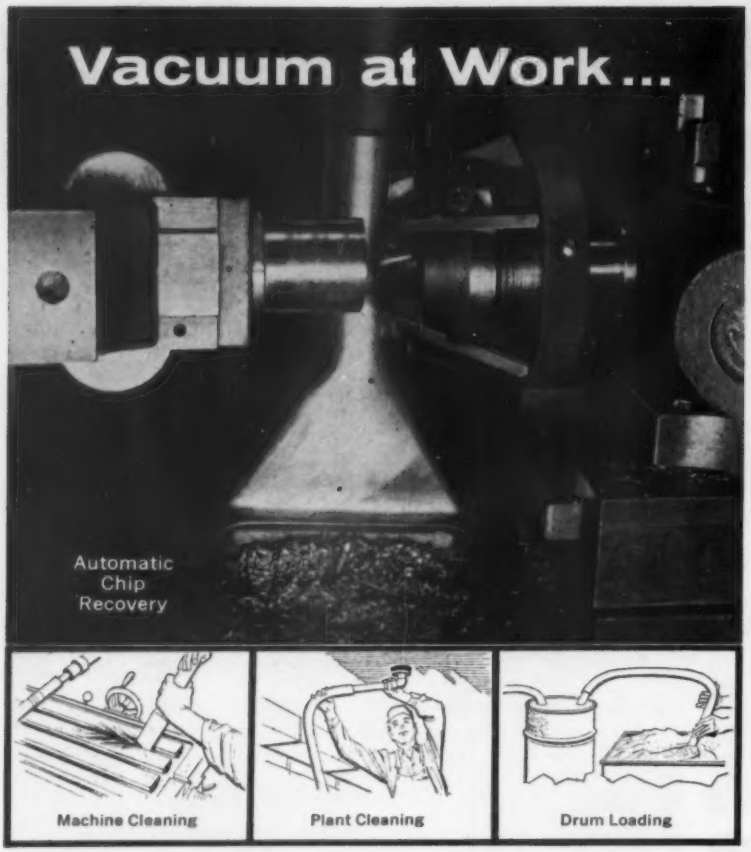
For your copy of 12-page illustrated booklet and a summary of recently bid prices on 4-ft-high and 6-ft-high all-aluminum fencing, write to Aluminum Company of America, 2057-D Alcoa Building, Pittsburgh 19, Pa.

ALCOA ALUMINUM

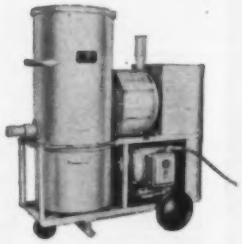
Your Guide to the Best in Aluminum Value

For Exciting Drama Watch "Alcoa Theatre," Alternate Mondays, NBC-TV, and "Alcoa Presents," Every Tuesday, ABC-TV

For more facts circle 623 on Reply Card



INVINCIBLE Units May Solve Your Problem!



Flexible Invincible vacuum equipment recovers, reclaims, processes, conveys. It will handle metals, liquids, lint, gases—virtually anything that can be passed through a vacuum line.

Vacuum created by Invincible units may be brought to the point of application on wheels or through pipe. Portable machines can be taken off production work during off periods and used as vacuum cleaners, thereby controlling health, fire and explosion hazards.

Capable of continuous operation, rugged Invincible equipment has solved hundreds of production problems, reduced costs and simplified the design of automatic machinery. Over 150,000 Invincibles are currently in use . . . 5,000 are in their 35th year of service.

There are 28 different standard Invincible models, plus special machines and other combinations, ranging from ½ to 10 H.P. More than 50 years of experience in vacuum application are available. Resident engineers in principal cities. Accurate free surveys can be made on short notice.

Write us for detailed information concerning *your* problems.

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO

For more facts circle 624 on Reply Card

NEW PRODUCTS

(Begins on page 170)

able cover plate of a standard three-gang wall box to facilitate installation and wiring. The control may be wall- or flush-mounted by means of an adaptor furnished. Included in this control is a line voltage thermostat, manual starter with thermal overload protection, summer-and-winter switch light that permits fan operation alone in summer, pilot light indicator for fan operation, and terminal block accommodating line to service, fan motor, and optional low limit aquastat or pressure stat. Wall box is 8⅛ in. wide, 4½ in. high, 1⅝ in. deep. Sarcotherm Controls, Inc.

59—PLASTIC SKYLIGHT comes in colors, too

Made of glass fiber-reinforced plastic, the Consolite Dome Skylight comes in pink, blue, yellow, green or white and features a "thermos bottle" design which serves to reduce heating and air-conditioning losses. This skylight is actually a twin-domed insulating plastic bubble. Dead air space between inner and outer domes gives it a low

rate of heat transmission. Its insulation value is claimed equivalent to a 2½-in. gypsum roof. The double thickness of reinforced plastic cannot be shattered by ordinary hailstorms, rocks, or vibration, manufacturer says, and is tougher than either glass or acrylic plastic.

This skylight is described as light in weight, easy to install. Square, round and rectangular shapes are available in three basic models: self-flashing, in low and high silhouette, and curb mounting. Sizes range from 14 in. square to 38 by 74 in, weights from 10 to 55 lb. Consolidated General Products, Inc.

60—VIBRATION INDUCER keeps materials moving

The Vibrolator CCVP is a rugged, high-amplitude vibration inducer designed to keep materials moving during unloading of railroad cars or hoppers. The "big shake" unit is said to be ideal for materials movement from massive bins, hoppers or chutes.

For more facts circle 625 on Reply Card ⟶

Good bet: You're paying for lubricants you don't need

Does this case sound familiar to you?

A midwest firm was buying lubricants on the recommendation of every department head, foreman or even operator. Inventory — often duplicated — was scattered all over the plant, yet shortages in one spot were never related to overstocks in another. The result: costly overstocking, extra handling, increased dangers of misapplication.

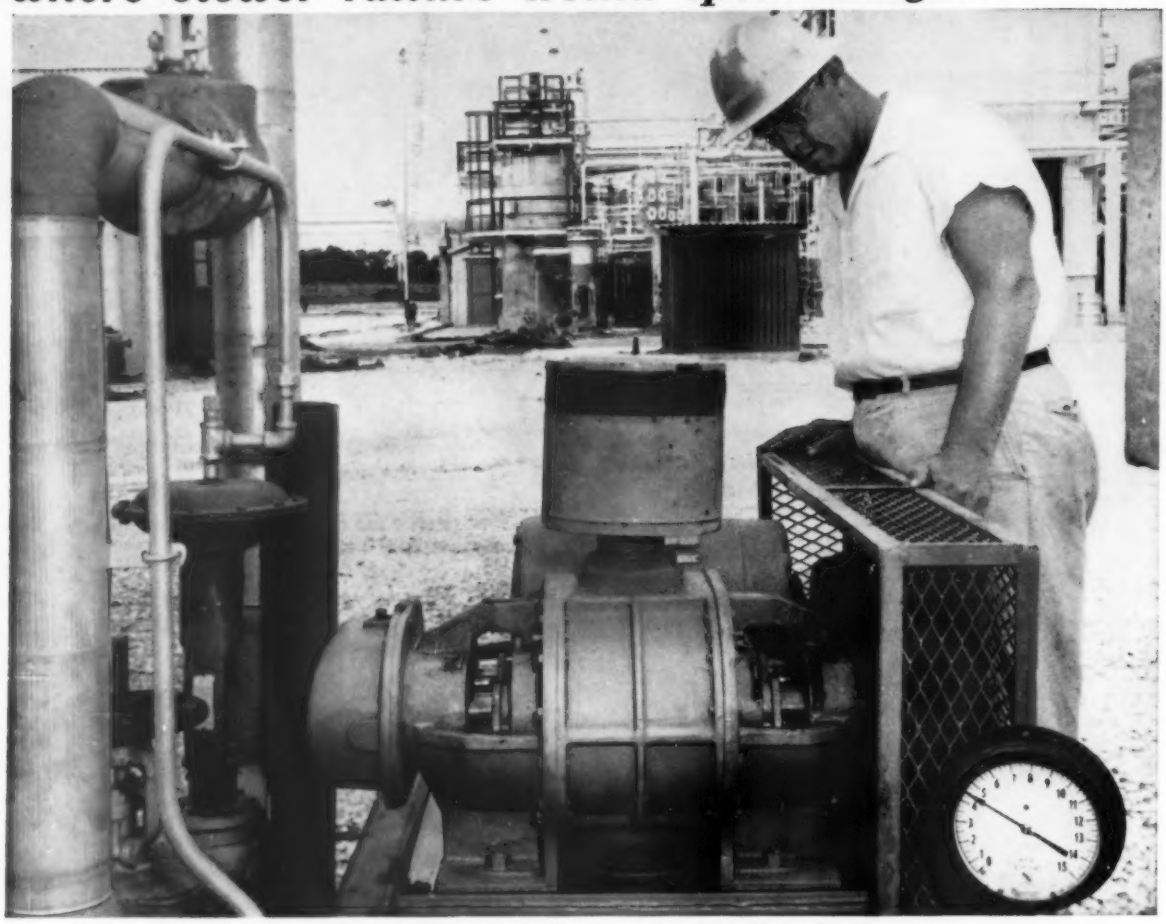
Management then instituted an Organized Lubrication Plan. Now they use 20 lubes instead of 97, have cut their purchase orders from 300 to 12 per year. Direct savings are estimated at thousands of dollars annually.

Can Organized Lubrication save money in your plant? Contact your local Texaco Engineer or write for "Management Practices that Control Costs via Organized Lubrication." The Texas Company, 135 East 42nd Street, New York 17, N. Y., Dept. E-82.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

TUNE IN... Metropolitan Opera
Radio BROADCASTS
every Saturday afternoon

where blower failure would spell Danger



Sutorbilt blower at Polymer Chemicals Division plant in Baton Rouge, La. Blower is required at a critical phase of catalyst activation in a new Phillips-type polymerization process.

W. R. GRACE DEPENDS ON A SUTORBILT ROTARY, POSITIVE-PRESSURE BLOWER

At W. R. Grace & Co.'s new Polymer Chemical Division, the catalyst for a new, high-density polyolefin production process must be protected in a pressurized air stream. A doubly-dependable Sutorbilt rotary positive-pressure blower was selected for these three important reasons:

1. Contamination must be avoided
Long-lasting, air-tight, Teflon seals and lack of lubrication in compression chamber prevent air contamination in a Sutorbilt blower.

2. Breakdowns would be dangerous
Simple, rugged, precision construction (only rotors and bearings move) means reliable service. Unit chosen by Grace has been in continuous operation for well over a year without repairs.

3. Pressure must be positive, constant
The two, counter-rotating "figure eight" Sutorbilt impellers produce a positive-pressure, *metered* air supply.

Sutorbilt blowers and gas pumps are precision-built to deliver air or gas in capacities up to 20,000 cubic feet per minute—at pressures up to 10 pounds. Write today for complete, illustrated literature on these efficient, dependable blowers. 1349 S-16

SUTORBILT IS WELL BUILT

CORPORATION, 2966 EAST VICTORIA ST. • COMPTON, CALIF.
SUBSIDIARY OF FULLER COMPANY • CATASAUQUA, PA.

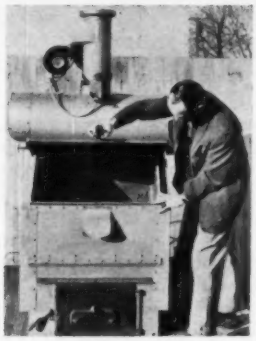
For more facts circle 626 on Reply Card

(Begins on page 170)

It is portable with its own mounting clamp and can be mounted in any position or angle convenient to the job. The Vibrolator is pneumatically-driven. Manuafcturer says it starts and operates with minimum air at any angle, is shock- and spark-proof, and can be controlled at any vibration frequency to more than 60 cycles per sec. Martin Engineering Co.

61—FURNACE can burn rubbish, deliver clean heat

The Shop Heater incorporates new stack and firebox principles designed to allow for burning of conventional fuels plus all kinds of rubbish, including rubber, and for the delivery of clean heat free of smoke and odors. Thermostatically controlled, this heating unit burns oil, gas, coal and wood, as well as rubbish, delivering up to 400,000 Btu when fired with oil or



gas, up to 500,000 Btu with rubbish. It weighs 1000 lb. The feed door is 30 in. wide, 14½ in. high. A removable heat exchanger can be slipped out of the furnace for quick cleaning. An 1800- to 3600-cfm fan permits ducting, and because the oil or gas burner is mounted on a track, the heater can be readily converted to a rubbish disposal unit by sliding the barrel of either unit out of a trap door in the rear of the furnace. While designed primarily for use as the main heating unit for plant facilities up to 5000 sq ft, the Shop Heater is also adaptable as a supplemental unit to a central heating system in larger units. Mastro-Hoskinson Mfg. Corp., Inc.

62—FLOOR CLEANER is strongly germicidal

Said to be three to six times more powerful than many germicides, Elimstaph No. 2 cleans, disinfects, sanitizes and deodorizes in a single operation. Manufacturer says it destroys

SHAMCO TEFLON® SHEET CONTINUOUS MOLDED TO ANY LENGTH, WIDTHS UP TO 48 INCHES

Need a low friction skid? Or a moisture-proof gasket? Or a non-adhesive lining? Then try SHAMCO Teflon sheet! A supply of this versatile Teflon material is fast becoming a standard item in plants, refineries and laboratories throughout industry. There are many reasons: it's heat resistant (550°F), it's chemically inert, it's non-adhesive, it's easy to use, it can be bonded to practically any material, and now it's available in *widths up to 48 inches by any length you want.* Order some SHAMCO sheet soon and, while you're at it, try some of the other SHAMCO standard shapes!

Tough, flexible, non-adhesive, chemically inert, heat resistant, low friction and weather proof, SHAMCO sheet and other shapes are now being used in:

- SOLID GASKETS
- NON-ADHESIVE LININGS
- BAFFLES
- SEPARATORS
- DOORSLIDES
- SKIDS
- BREAD SHEETING ROLLS
- GUIDES, HOPPERS and DEAD PLATES
- SNOW and DIRT PLOW BLADES
- SLOT LINERS
- COIL SEPARATORS
- BASES FOR SUB-ASSEMBLIES
- LAYER INSULATION

Engineered Plastic Products
W. S. SHAMBAN & COMPANY
11617 W. Jefferson Blvd., Culver City, Calif.
Meyer Road, Ft. Wayne, Indiana
160 Woodbine Court, Floral Park, New York
Stocking Distributors in Principal Cities

For more facts circle 627 on Reply Card

Industry's most complete line of HEAVY DUTY FLOOR MACHINES

As America's most widely used machines for cleaning industrial floors, TENNANT Machines are standard equipment today —in 96 out of 100 major plants.

You will find them in a class by themselves for *removing hard grease-caked dirt from your floors in one operation*. Here are typical cost-saving models:

FOR CONGESTED AREAS—Rugged, versatile walk-behind Floor Machine (Model K). Instantly pulverizes and picks up soilage from 16″ path. Powerful 1750 rpm wire brush shears off incrusted grime deposits and hurls it into the hopper. Leaves a clean, dry surface. Works close to machines, walls, etc. Gasoline or electric models; accessories for sanding, steel wool buffing, etc.

FOR AISLE CLEANING—Operator rides the TENNANT "L" as it cleans 21″ path at speeds up to 3 mph. Cylindrical tool revolves at 1600 rpm. Shaves off heavy build-up of grease, dirt, wax, rubber deposits, metal chips and dried paint, at *a single pass*.

Cleans up to 4000 sq. ft. per hour . . . a rate 6 men couldn't equal by hand.

Picks up as it cleans. Powerful vacuum system controls dust. Leaves smooth, level surface for efficient trucking.

Has sensitive hydraulic controls; tool pressure is easily adjusted to obtain desired cleaning action. Has ample power to remove thick, heavy grime.

FOR HIGH SPEED CLEANING—Powerful 25 hp TENNANT "R" cleans and picks up grime from 36″ path; moves with traffic at speeds up to 6½ mph. Shaves off grease and dirt to leave floor clean, dry, smooth, with excellent traction.

Cleans as fast as a 6 to 18 man scraping crew . . . and does a far better job. Vacuum system controls dust. Ten cubic foot hopper holds approximately 700 lbs. pulverized grime; lifts and dumps hydraulically in seconds.

WRITE TODAY *for illustrated bulletins . . . photos and data on how to reduce floor cleaning costs. G. H. Tennant Co., 771D N. Lilac Drive, Minneapolis 22, Minn.*

Industry's Most Widely Used
FLOOR MACHINES

TENNANT

SPECIALIZED MAINTENANCE EQUIPMENT

POWER SWEEPERS • FLOOR MACHINES • SCARIFIERS • ROOF SCRAPERS • CONCRETE ROUTERS

For more facts circle 628 on Reply Card

NEW PRODUCTS

(Begins on page 147)

Golden Staph and most other known pathogens, spores and fungi by penetrating the wall of the germ cell and disintegrating the organism from within. Residual in action, Elimstaph No. 2 has a phenol coefficient of 33, and is described as colorless, odorless and low in toxicity. Suggested applications, besides floors, include walls, equipment, lavatories, shower stalls, utility closets. It is economical to apply—an ounce makes a gallon of solution. Walter G. Legge Co., Inc.

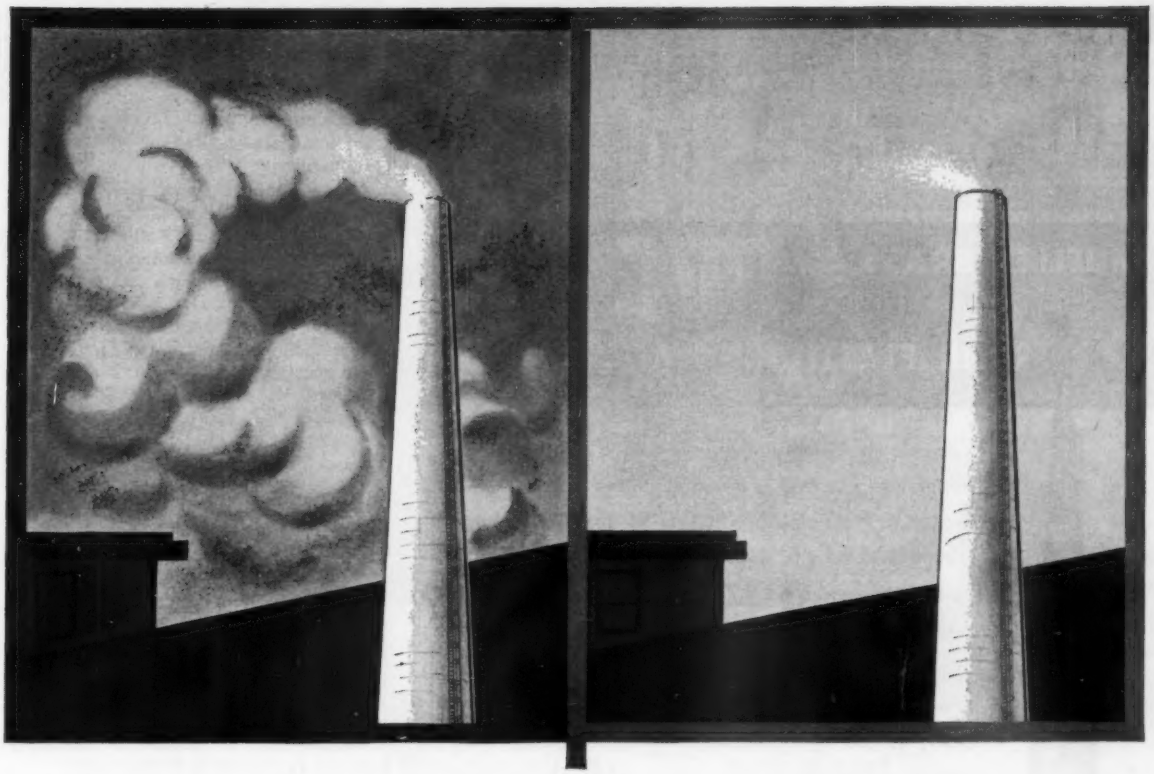
Reader Service Cards on pages 249-250 make it easy to get further information on any of these products. Just circle the item numbers of the products you would like to know more about.

63—DUPLEX RECORDER plots electrical quantities

The CH-37 Duplex Recorder is designed for plotting two related electrical quantities side-by-side on a single chart. The double record permits faster reading and helps eliminate possible reading errors associated with matching separate charts when correlating quantities such as watts and vars, volts and frequency, or wind direction and speed. The low burden, fast response recording elements trace on two 4-in. calibrated charts printed on a 10-in. wide record roll. The recorder incorporates such features as throw-away inkwell, multiple chart speeds, chart supply indicator and fluorescent-lighted chart face. It is available with complete set of rate gears and either a single speed synchronous motor giving 11 chart speeds ranging from ¼ to 30 in. per hr or a double speed synchronous motor with 28 speeds from ¼ in. per hr to 120 in. per min. General Electric Co.

64—LIQUID ALUMINUM casts without heat or pressure

Devcon F-2, is announced as a liquid aluminum, similar to company's Devcon F, an aluminum putty containing 20 per cent plastic. Devcon F-2 becomes liquid upon the addition of a hardening agent, manufacturer states, and 2 hr afterward the material becomes a durable, metallic mass similar in appearance to aluminum or steel. Devcon F-2 is reported to have excellent physical properties (com-



win your fight against air pollution

with a Dracco Dust Control System

Dracco can be your most helpful ally in the fight against air pollution.

For over 40 years, Dracco has specialized in producing cloth filtration and cyclonic equipment for control of airborne particles. This includes a comprehensive variety of collectors and filters to solve any industrial dust or fume problem, large or small.

Today Dracco systems satisfy the toughest anti-pollution laws in many of the nation's largest metropolitan areas. In anticipation of even more stringent ordinances, Dracco research is developing advanced filtering media and radically new agglomeration and collection techniques.

You can take advantage of this know-how by consulting Dracco on your problems of producing your company's most important new product—*pure air!* The result will be a soundly engineered system that combines economy with reliable long-term service.

When you are ready to tackle that air pollution job, remember Dracco.

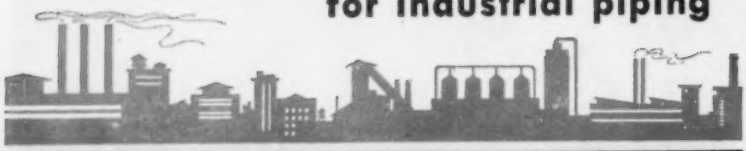
Multi-Bag Filter collects over ½ ton of dust daily at large eastern manufacturer, meets strict metropolitan air pollution requirements.

DRACCO DIVISION OF FULLER CO.
4035 East 116th Street • Cleveland 5, Ohio

DRACCO *airstream* conveyors
dust control equipment
(Pronounced Dray'co)

For more facts circle 629 on Reply Card

THE CORROSION-FREE WAY
for industrial piping



MUELLER BRASS CO. **PVC** (POLYVINYL CHLORIDE)
RIGID PLASTIC PIPE AND FITTINGS

Corrosion problems in your piping system can be permanently solved with an installation of Mueller Brass Co. PVC plastic pipe and fittings. PVC resists corrosive actions of water, oil, alkaline or salt solutions, gases and a wide variety of acids. The mirror-smooth interior bore prevents deposit build-up and insures continuous maximum flow capacity. Mueller Brass Co. PVC is economical, light-weight, can be easily joined by threading or solvent cement, thus saving on installation time and expense. The permanent built-in finish of PVC reduces maintenance by eliminating the need for costly painting or protective coating. Mueller Brass Co. PVC is tough and durable . . . withstands shock, impact and vibration and can be used at higher pressures than other similar materials.

For a corrosion-free, efficient industrial piping system at low cost, specify Mueller Brass Co. PVC rigid plastic pipe and fittings.

NORMAL IMPACT PVC—good impact strength . . . maximum chemical resistance.

HIGH IMPACT PVC — maximum impact strength . . . high chemical resistance.

Pipe is fabricated in 20' lengths; ½" through 3" sizes—I.P.S. schedules 40 and 80. Fittings are available in ½" through 3" sizes; threaded and socket-type for schedule 80 and in socket-type only for schedule 40.

Write for the new Mueller Brass Co. Technical Brochure.

MUELLER BRASS CO.
PORT HURON 52, MICHIGAN

274

POLYETHYLENE PIPE AND PLASTIC FITTINGS, COPPER TUBE, VALVES AND FITTINGS

For more facts circle 630 on Reply Card

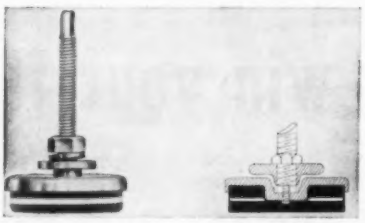
NEW PRODUCTS

(Begins on page 170)

pression strength 20,000 psi) and to be unaffected by most oils, chemicals and solvents. It bonds aluminum, steel, bronze, wood, ceramic and other materials to itself or to each other, company notes. It is described as non-shrinking and non-expanding and as having good abrasion resistance. It can be drilled, tapped or otherwise machined with metal-working tools. Application suggestions include filling of holes in castings and holes drilled incorrectly, and building up of worn sections on cast or machined parts, making inexpensive core boxes, patterns, other industrial tools. A trial kit of Devcon F-2 containing four 1-lb units and necessary components sells for under $12. Devcon Corp.

65—MACHINERY MOUNT for lighter duty uses

For speeding and simplifying installation of light-and medium-duty machinery, Unisorb Level-Rite 200 Series is designed for indiivdual loadings up to 200 psi. It features a vibration



control pad held in a steel-housing, supporting a leveling post and lug. Machines are installed and leveled by simply inserting the leveling post under a leg or bearing point, rotating the screw post from top or bottom and securing a locking nut. The screw post is free floating to compensate for uneven or pitched floors. The pad utilized absorbs to 85 per cent of transmitted vibration, says manufacturer, it reduces noise level and holds machinery in place. Unisorb Div., The Felters Co.

66—CABLE holds many pairs of thermocouple conductors

Thermo-Cable, a polyvinyl insulated multi-conductor cable for 6 to 56 pairs of thermocouple conductors, is announced as easier to handle and less expensive to install than individual pairs of thermocouple extension wire. Because its outer PVC jacket resists moisture, abrasion, heat and chemical action, Thermo-Cable can be installed in conduit, without conduit, in open

Puritan's Engineered Maintenance procedures help Orchard Paper Company get better performance at lower cost

"Has increased our sanitary maintenance efficiency by 30 per cent"

"This new method of organizing and controlling cleaning chores has really paid off. We're going to introduce it in our other plants"

When Orchard Paper Company first tested Puritan Chemical's new ENGINEERED MAINTENANCE plan, the objectives were: improved plant appearance, reduced maintenance costs and simplified supervision. Results were satisfying: an increase of 30 per cent in over-all sanitary maintenance efficiency. And, studying the program in operation, Orchard executives discovered other important benefits.

"ENGINEERED MAINTENANCE more than fulfilled our original expectations," reports Raymond W. Cobb, Plant Engineer. "An additional and unanticipated gain is that morale is higher throughout the plant. Another thing: the simple routines ENGINEERED MAINTENANCE makes possible allow us to train new custodians quicker and better. Old hands alone can handle the teaching of new personnel. We've taken this time-consuming job off our engineers' shoulders completely."

Systemized sanitation

Your plant has its own special requirements and desirable level of *sanitary maintenance*. The ENGINEERED MAINTENANCE Program Puritan recomends for your company is prepared for your individual needs. A specially trained Puritan representative surveys your buildings personally. On the basis of this on-the-scenes report, a team of Puritan specialists prepares day-to-day, week-to-week and month-to-month procedures.

They set these up for you on an engineered basis . . . train your janitors and porters . . . call regularly to review progress and provide further training as needed.

This entire program costs you nothing

Puritan means exactly that. No strings. As a user of Puritan sanitary maintenance products you receive the service free.

Meanwhile you are not tieing yourself down in any way. Nationally used Puritan products are competitively priced and fully guaranteed. You are not asked to sign any long-term contract. You pay nothing extra — either directly or indirectly. The burden of proof is upon us.

Frees your time at once

ENGINEERED MAINTENANCE starts to take nuisance details off your hands from the very first day. You have additional hours to devote to management responsibilities . . . doubly important today when increased investments in labor, materials and equipment place a premium on efficient operation. ENGINEERED MAINTENANCE is a tested method of controlling sanitary maintenance — conveniently . . . surely . . . economically.

A good way to start

Send for "ENGINEERED MAINTENANCE." This new technical booklet shows you precisely how Puritan helps you achieve trouble-free maintenance...cut your company's costs...save your own time.

© COPYRIGHT 1959 PURITAN CHEMICAL COMPANY

PURITAN CHEMICAL COMPANY

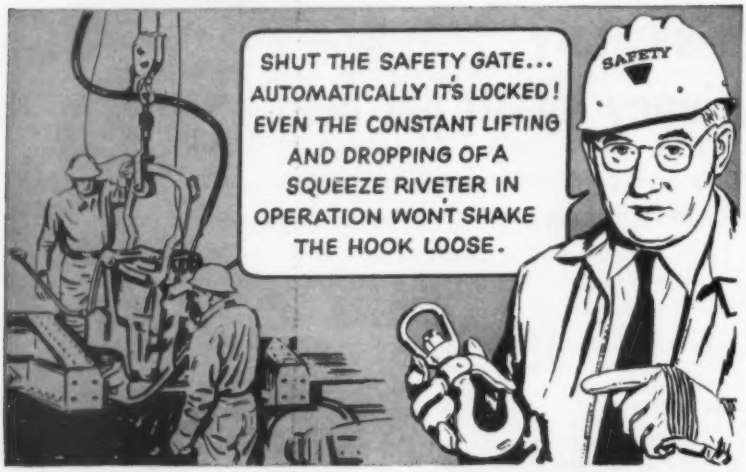
EXECUTIVE OFFICES: 916 ASHBY STREET, N. W. • ATLANTA 18, GEORGIA

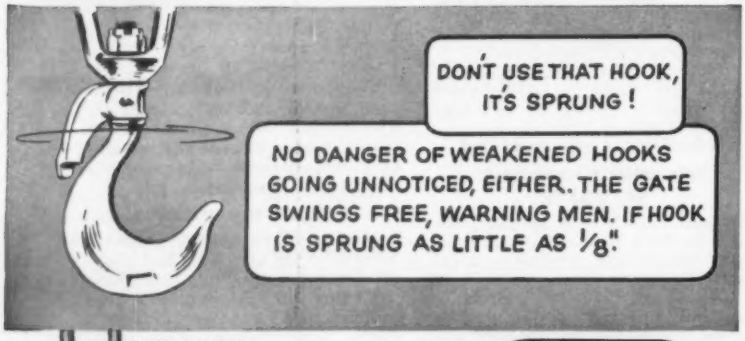
PLANTS & WAREHOUSES: ATLANTA, GEORGIA • HOUSTON, TEXAS • ST. LOUIS, MISSOURI

For more facts circle 631 on Reply Card

WE LOCKED OUT THIS LIFTING HAZARD!
OUR MEN AND MATERIALS ARE PROTECTED FROM THIS. WE'VE REPLACED ALL OF OUR OLD STYLE HOOKS WITH BULLARD SAFETY HOOKS THAT LOCK LOADS IN.
SAFETY

says Safety Engineer, Frank Treadway of General American Transportation Corporation, Plant 1, East Chicago, Indiana


SHUT THE SAFETY GATE... AUTOMATICALLY IT'S LOCKED! EVEN THE CONSTANT LIFTING AND DROPPING OF A SQUEEZE RIVETER IN OPERATION WON'T SHAKE THE HOOK LOOSE.
SAFETY


DON'T USE THAT HOOK, IT'S SPRUNG!
NO DANGER OF WEAKENED HOOKS GOING UNNOTICED, EITHER. THE GATE SWINGS FREE, WARNING MEN. IF HOOK IS SPRUNG AS LITTLE AS 1/8".

Pushbutton lock
With gate open hook's throat is 100% clear
Available in sizes 1 to 16A for all type hoists, tuggers and come-alongs. Write for safety hook data sheet.
E. D. Bullard Co., 2680 Bridgeway, Sausalito, California

BULLARD
INDUSTRIAL SAFETY EQUIPMENT

For more facts circle 632 on Reply Card

NEW PRODUCTS

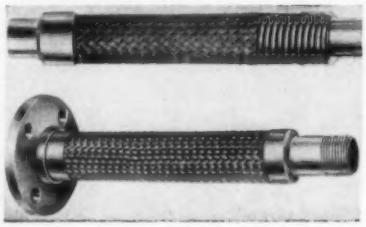
(Begins on page 170)

troughs or in raceways. It is reported most advantageous where thermocouple extensions must be run a long distance from a number of thermocouples to measuring instruments.

In this cable, individual conductors are insulated in polyvinyl chloride and then concentrically cabled with overall polyvinyl chloride insulation. Aluminum-backed Mylar tape, wrapped around the conductor bundle, provides electrostatic shielding. Thermo-Cable is made from 20 or 16 solid wire, or in 17-gage stranded construction when extra flexibility is required. Each conductor is ISA color-coded. All cables contain a copper wire which serves as a ground or communications wire. Thermo Electric Co., Inc.

67—VIBRATION DAMPERS curb pipeline shakes, noise

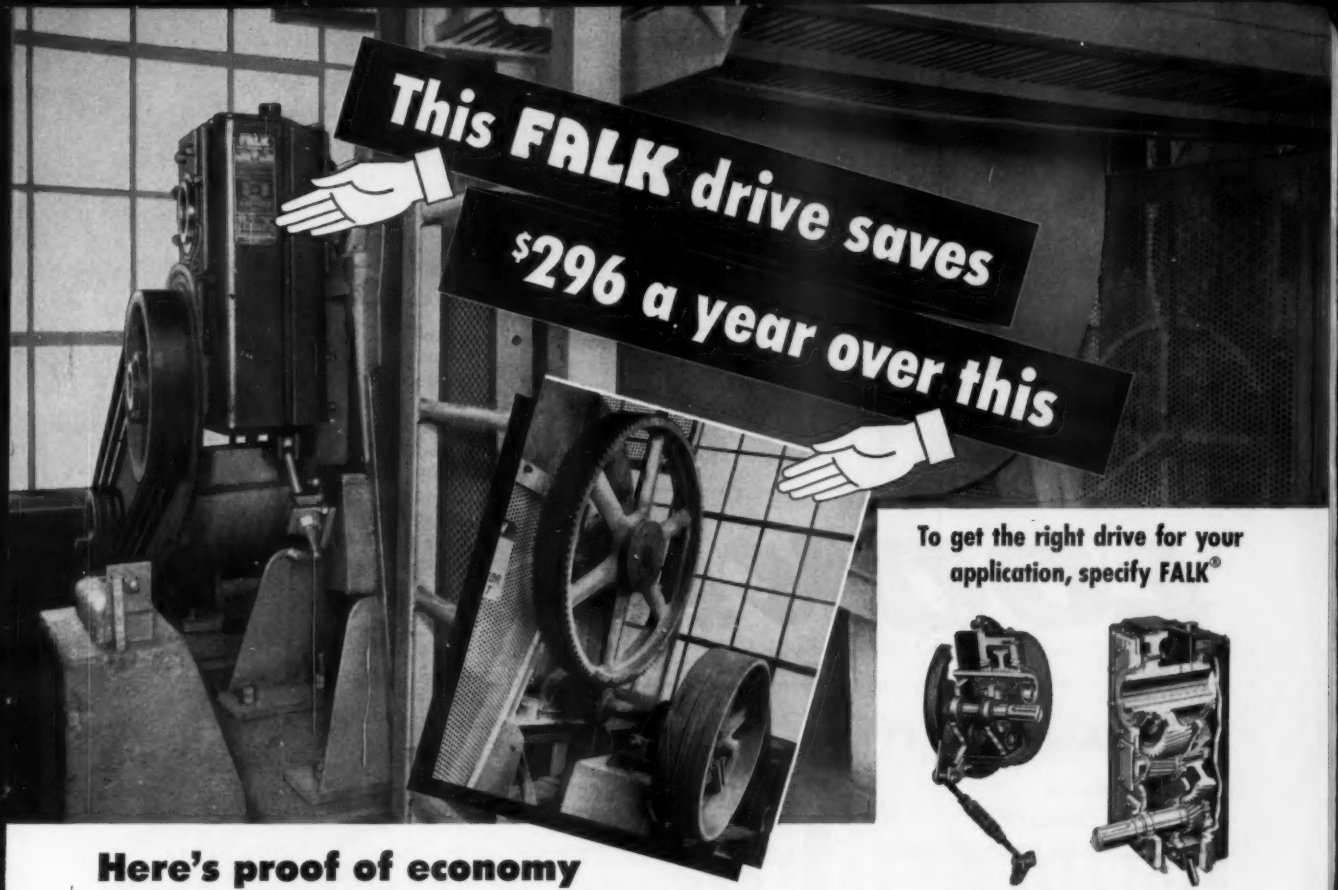
Stainless steel Allflex Vibration Tamers are claimed to remove excessive vibration and dampen noise in a broad range of pipeline applications and smooth out pulsations of force pump systems. The units are rated to 15,000 psi burst pressure and for temperatures to 1500F. Scale formation is



minimized while handling exhaust, superheated steam, gas or oils at extreme temperatures, says manufacturer, and stainless steel's corrosion resistance makes these units suitable for chemical conduction. Standards units include tube or pipe ends, for brazing or welding unto tubing or pipelines, as well as threaded and/or flanged ends. They come in standard pipe sizes from ¼ through 12 in. Allied Metal Hose Co.

68—TIE WIRE fastens piping in corrosive atmospheres

Copperply is pre-packaged copper-covered steel wire introduced for use with tie wire reels for fastening pipe insulation where salt spray and other corrosives prevail. The 16-gage wire is 15 per cent copper by weight, providing a 1¾ mil protective copper coating. Copperply is made by continuously electroplating copper con-



Here's proof of economy with FALK Shaft Mounted Drives

PROBLEM—For many years, a prominent Eastern abrasives manufacturer* experienced high maintenance and down-time costs, as well as excessive noise and vibration, in the operation of 19 pebble mills driven by open spur gears. Drive gears and jack shaft pillow blocks required frequent repairs or replacement, and trunnion shafts often failed, due to radial overloading of the bull gear when broken pinion teeth bottomed between gear teeth.

SOLUTION—After numerous unsuccessful approaches to these problems, the solution was found by mounting a Size 315J FALK Shaft Mounted Drive directly on the mill drive trunnion. This eliminated objectionable gear noise and vibration...greatly reduced costly down-time and loss of production...and cut annual maintenance and replacement expenses as indicated by the following figures taken from the customer's records:

Spur Gear-and-Pinion Drive		FALK Shaft Mounted Drive	
Bull Gears	$ 56	VEE Belts	$ 30
Pinions	120	FALK Shaft Mounted Drive (based on 10-year life)	70
Pillow Blocks	90		
VEE Belts	30		
Trunnion (5-year life)	100		
Annual cost	$396	Annual cost	$100
		ANNUAL SAVINGS	$296

IF OBSOLETE DRIVES ARE COSTING YOU MONEY, a change to Falk All-Steel Shaft Mounted Drives can effect important savings in money and production. Used on almost any type of machine, these compact, rugged units are establishing new standards of economy and efficiency in many industries. Specify FALK Drives on your purchased equipment...For full details, **write for Bulletin 7100.**

*Name on request

THE FALK CORPORATION, MILWAUKEE 1, WISCONSIN

MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS

Representatives and Distributors in Most Principal Cities

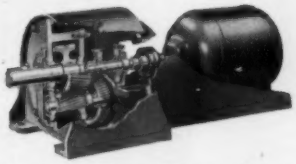
For more facts circle 633 on Reply Card

To get the right drive for your application, specify FALK®

SHAFT MOUNTED DRIVES

Horizontal or vertical units—½ to 50 hp—420 to 5 rpm—single and two double reduction ratios—output torque ratings up to 41,000 lb-in (consult factory for higher torque capacity).

• • •



ALL-MOTOR® MOTOREDUCERS

Sizes up to 75 hp—furnished with or without standard foot-mounted motor—standard output speeds 1.2 to 520 rpm (with 1750 rpm motors)—ratios as high as 54,000:1 in semi-standard designs. Integral units (gearmotor type) also available. Ask for **Bulletin 3100.**

• • •

FALK Drives are available from factory and distributor stocks from coast to coast. Consult your Falk Representative or Distributor.

FALK

...a good name in industry

NEW PRODUCTS

(Begins on page 170)

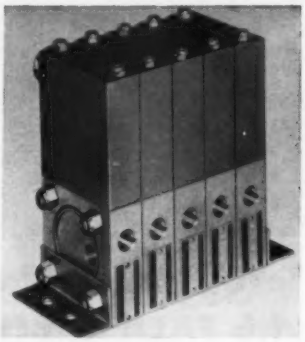
centrically around a steel core wire. It comes in 4-lb coils and is for use with the Ideal Tie Wire Reel (Ideal Reel Co.). National-Standard Co.

69—SWITCH SERVES to reduce control action lag

Faster and more reliable remote control of pneumatically-operated processes is possible with this positioning switch, manufacturer announces; it eliminates lags between switch and actuator mechanism. The switch is 20 per cent smaller than company's earlier models. It is used primarily for remote control of pneumatic valves or damper motors. Turning the knob increases or decreases flow of compressed air to these devices, opening or closing them to desired position. According to manufacturers, hysteresis, or the lag between a switch position change and corresponding air pressure change, is eliminated in this switch by use of a responsible ball valve instead of a needle valve. The switch is available for flush or surface mounting. Further information is in Bulletin 357-3 and Technical Data Form P-75. Powers Regulator Co.

70—SOLENOID VALVE is slim, fast-acting unit

Streamlined in appearance, the Quick-As-Wink Solenoid Operated S-3C-S Valve is only 1 in. thick, 3 in. wide and 6-1/16 in. high, and can be mounted on machines, even where space is limited. These valves can be used with air or oil; pressures to 125 psi; temperatures to 150 F. They are tapped for ⅛-or ¼-in. pipe connection; rated at 300 cycles per minute for continuous operation, up to 700 cycles for intermittent service on air at 120 psig. They come in "normally closed" or "normally open" designs



for around $30.00 each, or four-way action for around $35. They can be manifolded together, as shown, without special parts.

Valve housing is milled from solid aluminum bar stock valve chambers, in the straight-through bore, are formed with metal spacers, held in metal-to-metal end abutment, which support and position the O-ring seals. The stainless steel valve plunger is hollow and radially ported. The solenoid is enclosed in a brass housing, and positioned on two resilient O-rings with a spring—a shock-absorbing mounting.

The side of the housing of each valve is counterbored, trepaned for an O ring, and provided with four through holes, permitting valves to be manifolded together in any of four 90-deg angle positions. Line air passes through each valve, across the sealed counterbore and on to the next valve, letting eight valves operate simultaneously from a single supply, or up to 16, from two supply lines. Hunt Valve Co.

71—THERMAL INSULATION is machine applied

Cafco Heat-Shield is announced as a proportioned blend of refined mineral fibers and inorganic binders. Machine spray applied in a continuous blanket form, it acts to provide an economical,

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TOP QUALITY
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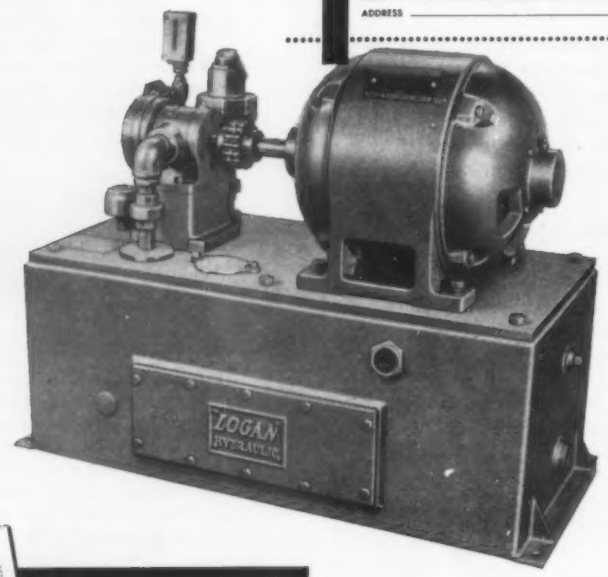

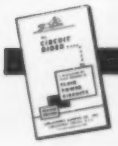

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A 32-page manual on fluid power circuits (fifth edition) completely revised to present current engineering trends.

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ILLUSTRATED—LOGAN MODEL 6031 HYDRAULIC POWER UNIT

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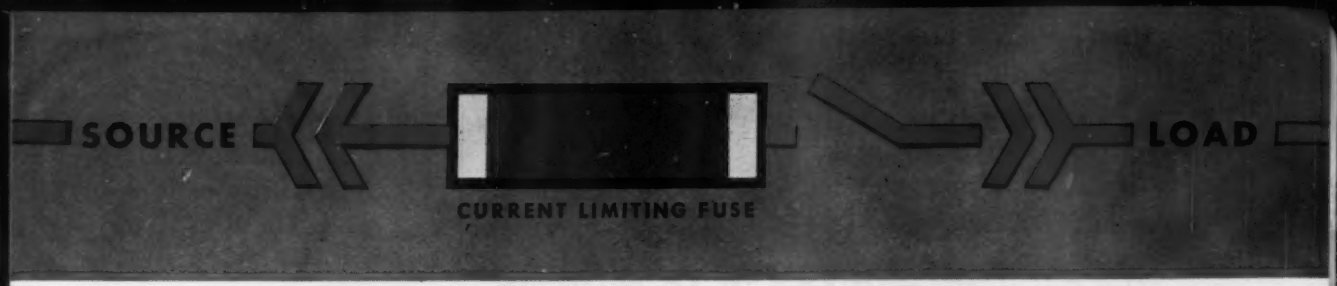


CURRENT LIMITING FUSE ON *SOURCE* SIDE OF SWITCH FOR SHORT-CIRCUIT PROTECTION

Improved protection with General Electric ROLLOUT Switch and Fuse Equipment

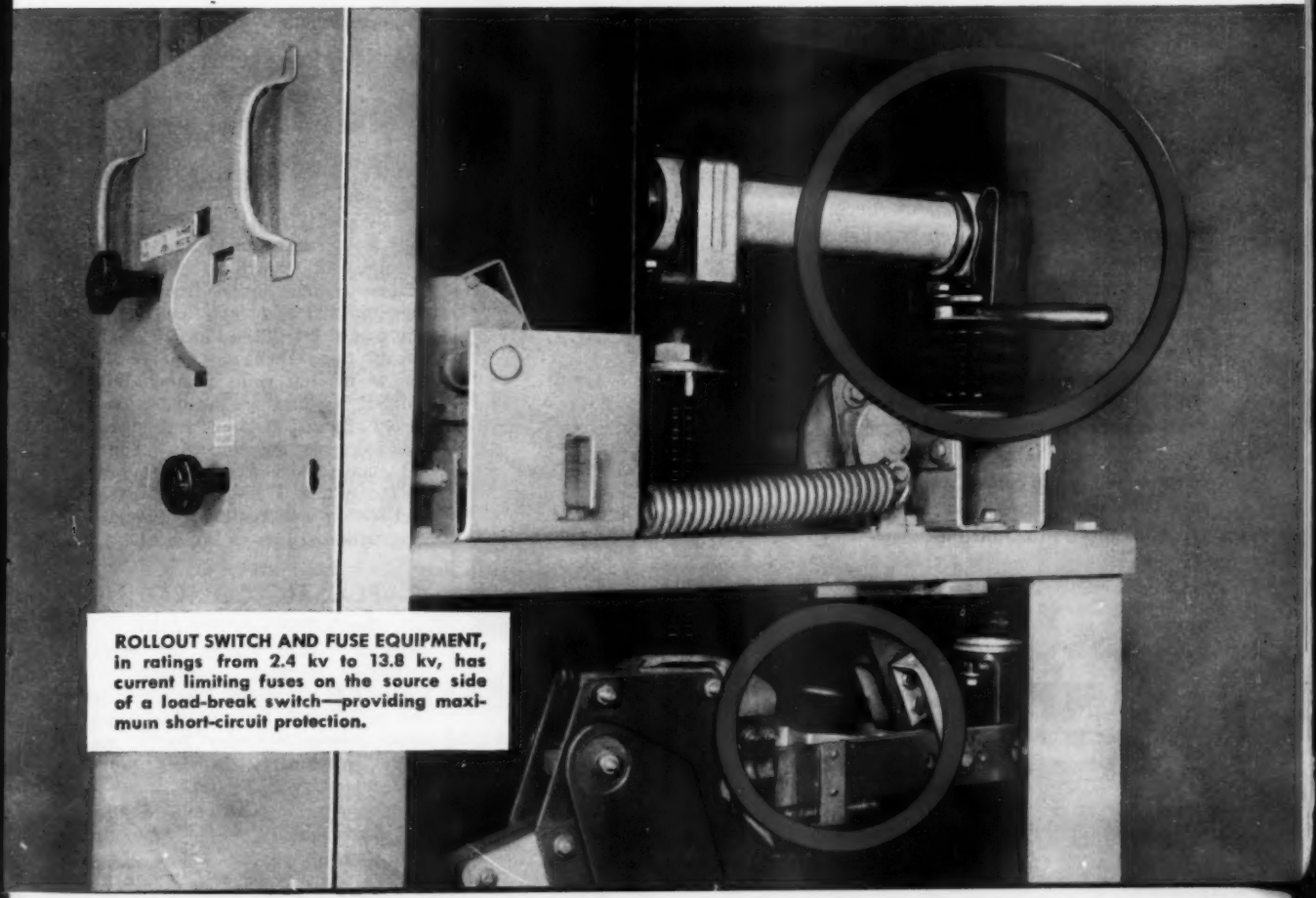
You get improved short-circuit protection with General Electric's new Rollout Switch and Fuse Equipment—because current limiting fuses are placed on the *source* side of a load-break switch.

You also get greater safety, easier maintenance and inspection, and installation versatility—with the new equipment's rollout feature.

Call your nearest General Electric Apparatus Sales Office for more information or write for Bulletin GEA-6623, General Electric Company, Section M-514-3, Schenectady, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

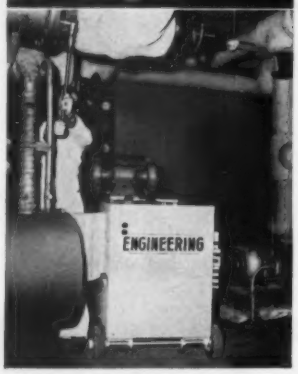


ROLLOUT SWITCH AND FUSE EQUIPMENT, in ratings from 2.4 kv to 13.8 kv, has current limiting fuses on the source side of a load-break switch—providing maximum short-circuit protection.

"Our Snap-on
MOBILE WORKSHOPS
Paid for Themselves in 12 Months"

So says Carl Schiffers, maintenance superintendent of the Montreal Children's Hospital — Canada's newest and finest. His problem is maintaining a multi-million-dollar plant with a small staff and a close budget.

Snap-on was called in and recommended necessary tools and equipment in convenient Roll Cabs for each department. Here is Mr. Schiffers' report at the end of a year's operations: *"The cost of Snap-on equipment was written off within the first year of use by time saved in bringing a fully equipped workshop to every job and avoiding costly shutdowns of our machinery."*



Saves $10,000 in one year

In another installation, a user reported an estimated yearly saving of $10,000 through the use of *Snap-on* Mobile Workshops.

If you measure lost time in dollars . . . then the minutes spent by your workmen backtracking for missing tools, parts and equipment become wasted dollars. A *Snap-on* "workshop-on-wheels" can become an important moneysaving factor in your plant.

Take a look at your departments through the eyes of an experienced *Snap-on* tool engineer. He's trained to survey your tool-using departments and submit suggestions and recommendations. You may be overlooking a chance for big savings. Call your nearest *Snap-on* branch office or write direct for more information.

SNAP-ON TOOLS
CORPORATION
8068-D 28th Avenue • Kenosha, Wisconsin
For more facts circle 636 on Reply Card

NEW PRODUCTS

(Begins on page 170)

lightweight, incombustible retardant to heat transmission. K-factor is 0.26. Manufacturer recommends product for use in metal buildings, masonry buildings and on industrial equipment. Heat-Shield may be applied directly to flat or curved surfaces, company says, without special accessories for mechanical attachment or key. Bulletin I-10 gives data. Columbia Acoustics and Fireproofing Co.

72—CURTAIN WALL is economical, unit system

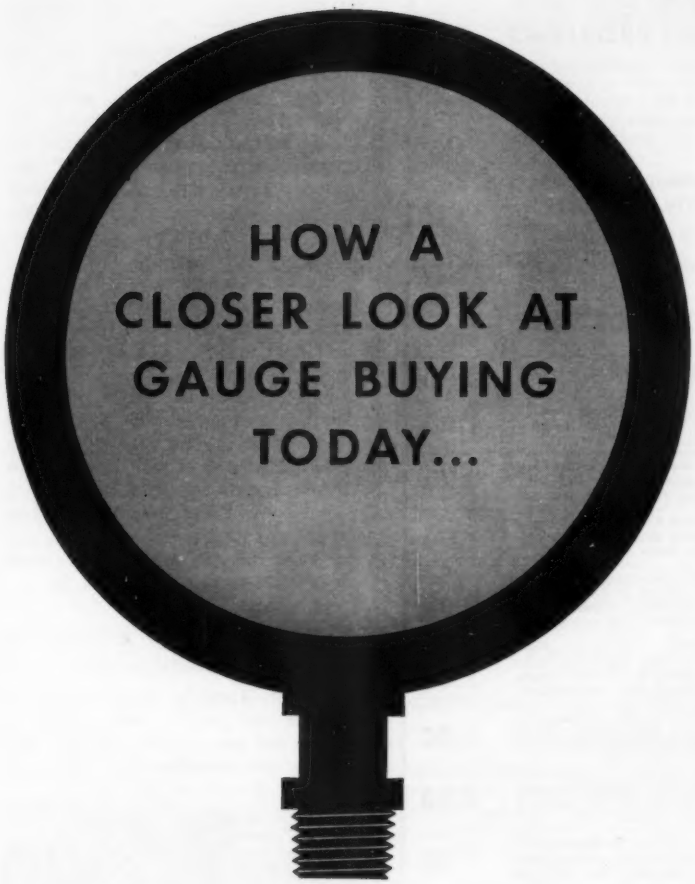
Fenmark is announced as an economical, factory assembled steel curtain wall system offering design flexibility and early occupancy. There are two categories of this grid unit system. Fenmark I is a pre-engineered system providing unusual economy because of large volume production line assembly of its components. Grid units come in 4-, 6- and 8-ft widths and 9-, 10-, 11- and 12-ft heights. Fenmark II offers custom advantages—a full range of sizes and proportions within the grid unit limited only by practical car loadings and prescribed wind loading conditions.

Field erection in single or multi-story construction of these curtain

walls is reported quickly and easily accomplished. Individual grid units are inserted into the head channel or stack channel and then the unit is swung in at the sill and dropped onto spacing lugs. Then the unit is slid over to the left jamb channel. Both Fenmark systems are available in a variety of panel materials and finishes including glass and porcelain textures and many colors. Perimeter framing for the system is 12-gage cold rolled steel with a zinc coating and welded construction. Fenestra Inc.

73—PLASTIC COMPOUND does many repair jobs

Tests of Plastic Mastic, an epoxy-polyamide chemical compound, are reported to show that it is practical and economical for repairing floors, walls, ceilings, driveways, curbs, masonry, machinery, fixtures, tanks,



can help cut your gauge maintenance costs

Been taking gauges pretty much for granted? As to the price you pay, accuracy you buy, performance you get . . . gauges you use and their maintenance costs? Maybe it's time for a closer look at the United States Gauge line and how it can streamline buying. USG features the most comprehensive line of indicating dial pressure gauges you can draw on . . . in range of case styles, materials and sizes, in pressure ranges and in price . . . up to the finest gauges money can buy. The *completeness* of the USG line can help you avoid over-buying, under-buying, help you get exactly the gauge performance you pay for . . . from one source! As shown at right, exclusive USG design features even help cut maintenance costs. Check your USG distributor for your next gauge requirement. See the Yellow Pages, or write for catalogs and name of your nearest USG distributor, today.

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Division of American Machine and Metals, Inc., Sellersville, Pa.

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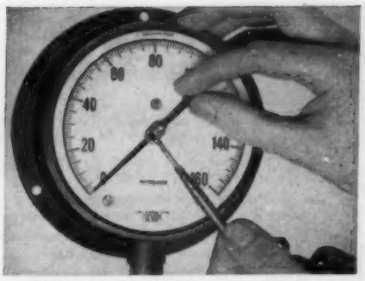
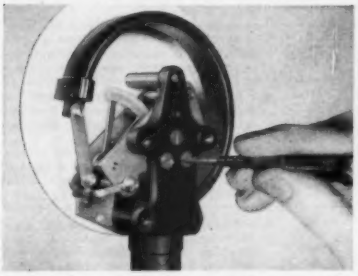


NOTE that with a USG Supergauge®, complete recalibrations can be made faster than with any other process gauge. For example: "zero shift" adjustments are made from the front with gauge in operating position, and without removing pointer from the shaft.

NOTE that with USG Mono-Unit design, internals are in one assembly which lifts out intact. Legend on dial gives full information for instant identification of model number and materials in components. More maintenance minutes saved!



NOTE that with USG Arc-Loc® movement, corrections for "scale shape" (linearity) errors and "range" adjustments are both made from the rear; no need to remove pointer and dial. USG's unique locking method eliminates creep during locking, saves more time! USG Supergauges meet A.S.A. standards for Grade AA Test Gauges, including accuracy to ½ of 1%. *Write for Catalog 1819.*

SAVINGS IN USG A-LINE, TOO!
Premium gauge construction at savings up to 40% of premium prices! Major economies in pressure measurement where you may now be buying more gauge than you need! Meets A.S.A. Grade A standards, including accuracy of 1%. Wide choice of options. Has Supergauge Mono-Unit design — cuts recalibration time. *Write for Catalog 305.*

For more facts circle 637 on Reply Card

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to our readers . . . .

AVAILABLE HELP FOR PLANT PROBLEMS

Many outstanding articles published in Plant Engineering and Power Engineering have been reprinted to assist you on your everyday job problems. Following is a list of the available reprints with prices. Look this list over, decide which ones you want, fill in the coupon at the bottom of the page and send it to us with your check or money order.

Some of these reprints are in comparatively short supply so get your order in early.

Which one (ones) will serve you best?

ORDER No.	INFORMATION	UNIT PRICE
1	The Coal Storage Manual—24-page reprint; on quantity orders, special price will be quoted.	$1.00
2	Industrial Lighting—12-page manual covers lighting factors a plant engineer should consider. Discusses voltages, costs, etc.	0.50
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6	Construction Specifications—20-page reprint of five-part article on construction specs. Discusses what should be included in specs; payments, arbitration; construction bids; signing contract; progress report and final inspection. A copy of "General Conditions" will accompany the reprint.	2.00
7	Your New Industrial Power Plant—How to Get It Into Operation—24-page reprint of series of articles by Paul N. Garay from 1957 issues on building your new plant right and how to set up operating records.	1.00
8	What It Costs to Modernize Small Industrial Power Plants—24-page reprint of series of articles by H. D. Fisher from 1957 issues, giving six case studies of plants from 25,000 to 50,000 lb of steam per hour capacity.	1.00
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NEW PRODUCTS

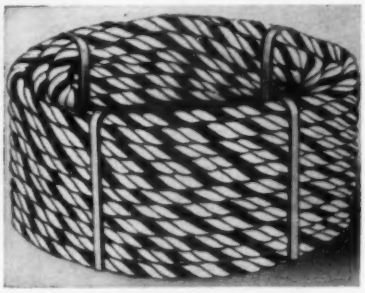
(Begins on page 170)

plumbing and for filling leaks, breaks, holes and cracks. This low-cost material is claimed permanently effective with almost every known material—concrete, metals, wood, ceramics, glass, rubber, cloth, most plastics etc. Plastic Mastic comes in three sizes of repair kits, each consisting of two cans of equal size—one containing the white base (epoxy resin) and the other the black hardener (polyamide). Equal parts of base and hardener are mixed to a neutral gray composition. Application is simple, says manufacturer, and the mix can be formed to a fine edge, and, in its cured form, can be sanded, drilled and machined.

Plastic Mastic is described as nonflammable, containing no volatile solvents and having virtually no irritation potential. Speed of reaction depends on temperature and amount mixed. At room temperature cured Plastic Mastic is hard to the touch in 4 hr, can be walked on in 8 hr. Heat speeds curing. Williamson Adhesives, Inc.

74—BARRIER ROPE made of high visibility plastic

Ipco Poly-Rope is triple strand, of polyethylene plastic, two strands of yellow and one of black. Higher tensile strength, excellent dielectric prop-

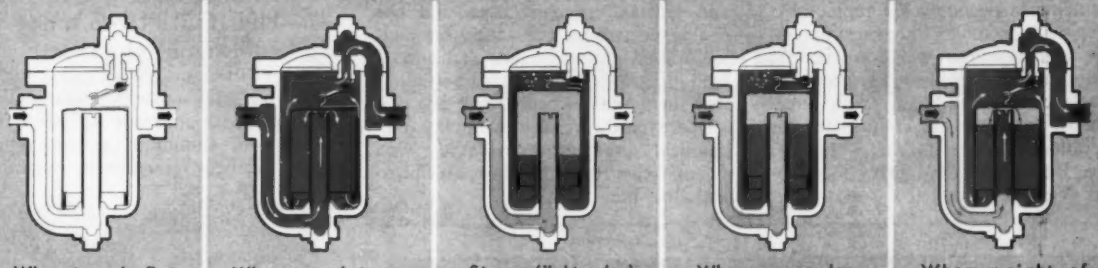


erties, light weight, durability and low water absorption are claimed for this barrier rope. Also, company points out, this rope does not readily absorb dust and is unaffected by oil. Industrial Products Co.

75—IMPULSE TRAP for light condensate loads

Design of the Yarway No. 30 Impulse Steam Trap permits exceptional economy of operation and maintenance at light loads, says manufacturer. The lever-type valve, which pivots about a fulcrum, discharges air and condensate at full capacity at start-up time and snaps shut when steam reaches

This simple trap operating principle provides the efficiency, dependability and freedom from maintenance necessary for the most profitable use of steam



When trap is first installed, the inverted bucket is down and the valve is wide open.

When steam is turned on, condensate (solid color) flows into trap and out through discharge orifice, until —

Steam (light color) reaching the trap floats the inverted bucket and closes the valve.

When more condensate enters the trap, the bucket loses buoyancy and pulls on valve lever.

When weight of bucket times leverage overcomes pressure on valve, bucket sinks and opens trap.

Key: condensate steam steam bubbles air bubbles

ARMSTRONG INVERTED BUCKET STEAM TRAPS

are designed and made to give you these big benefits:

● Amstrong Traps, the first inverted bucket steam traps, now represent the most advanced development of this time-proven principle. They provide all the advantages necessary for efficient, economical condensate drainage from virtually all types of steam using equipment.

1. *No steam loss* – Steam never reaches the orifice even when there is no condensate load.
2. *Automatic air elimination* – Vent in trap bucket passes air and other non-condensibles through to be discharged with condensate.
3. *No cooling leg required* – Condensate is discharged at steam temperature as fast as it reaches the trap because trap operates on difference in density between steam and water not on temperature.
4. *Operates on any back pressure* – Failure of one trap in system will not cause others to open because high back pressure does not affect an Armstrong trap other than to reduce capacity. As long as there is a pressure differential across the orifice the trap will close on steam and open for condensate.
5. *Unaffected by ordinary dirt* – Swirling action of condensate keeps dirt in suspension until discharged with condensate, prevents it from lodging in valve.
6. *Completely dependable* – Proved design plus the use of all stainless steel working parts assure continuity of service and length of service unmatched by any other trap.
7. *Big capacity in a small, economical package* – Armstrong design gives you the highest practical capacity for any given pressure. And remember, Armstrong capacity ratings are based on *hot* condensate at the *working pressure differential* stated, not on theoretical orifice capacities.

Further information on these advantages plus much additional information is given in the 48 page Armstrong Steam Trap Book. Ask your local Armstrong Representative or write direct.

860 Series for low pressure heating service.

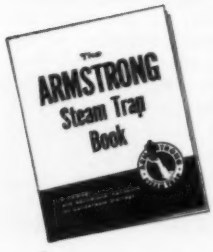
800 Series, side inlet, side outlet.

No. 801, side inlet, bottom outlet.

880 Series, integral strainer.

200 Series, bottom inlet, top outlet.

Forged Steel Series for high pressures, high temperatures.



The 48 page Armstrong Steam Trap Book tells how to correctly size, install and maintain steam traps for any pressure, any temperature, any load plus full catalog data on Armstrong Steam Traps. Ask for Catalog K.

ARMSTRONG MACHINE WORKS

9124 Maple Street • Three Rivers, Michigan

For more facts circle 639 on Reply Card

NEW PRODUCTS

(Begins on page 170)

trap to provide closer shut-off. The lever action is also said to provide quieter operation. Contributing to maintenance economy are replaceable valve-seat assembly, only one moving part and stainless steel construction. The trap is suggested for use on steam tracer lines, steam main drips, small platens. It comes in ½-in. size, for operating pressures from 8 to 600 psig. Bulletin T 1744 gives information. Yarnall-Waring Co.

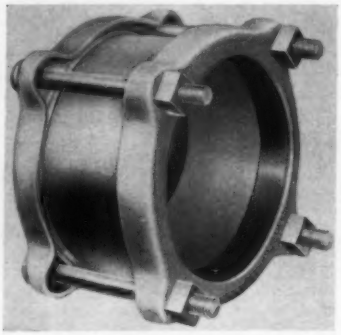
76—GRANULAR CHEMICAL kills weeds and grasses

Chlorea Granular is a non-selective weed and grass killer in pelletized form. It contains sodium chlorate, sodium metaborate and monuron. This combination kills deep-rooted weeds and grasses, company says, and has prolonged soil-surface action on shallow-rooted grasses, weeds and annual seedling growth. New growth is inhibited for a year or more. The dry pellets are easily applied with any mechanical spreader or by hand. One pound treats 100 sq ft. Chipman Chemical Co., Inc.

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 249-250.

77—PIPE COUPLING made of lightweight aluminum

Style 38 Aluminum Coupling combines company's compression sealing principle with inherent lightness and strength of aluminum, permitting up to 60 per cent reduction in weight, it

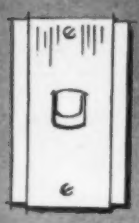


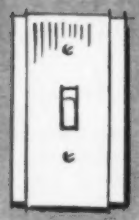
is said, over other types of couplings. Available in sizes from 2 to 6 in. OD, couplings are claimed ideal for suction, food processing, pneumatic, transmission, and pressure line applications in dry bulk materials handling, truck tank piping, oil and chemical piping. Couplings permit up to 6-deg pipe deflection, handle working pressures to 150 psi and absorb vibration, expansion-contraction and other piping stresses. Dresser Mfg. Div., Dresser Industries, Inc.

78—PVC AIR WASHERS offer economy of operation

Of rigid polyvinyl chloride and available in capacities from 1000 to 54,000 cfm, these air washers are claimed to handle acids, alkalies and corrosive fumes more economically and efficiently—cleaning 96 to 99 per cent of contaminants that are instantaneously soluble in water. Due to the smooth and non-porous surface of the unplasticized PVC, there is less resistance to air flow, no water absorption and less material build-up.

In operation, this washer employs a three-way action. 1) Air enters the first section where velocity is decreased and air is sprayed. 2) Air then enters the washer bed where the PVC Raschig rings change air direction at least eight times for thorough cleaning action. 3) Air is fed through the eliminator section where particles of heavily entrained water are removed, leaving the 97 per cent saturated clean





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...the switch that looks right, feels right and is right for every type of wiring job.

Here at last! After intensive testing, Pass & Seymour, Inc., proudly presents *ROCKER-GLO* . . . the *one* switch that answers all your needs.

No matter how you choose to operate the new *ROCKER-GLO*, the merest brush of a finger produces instant action . . . *and ROCKER-GLO glows in the dark!*

AVAILABLE in Despard interchangeable type, Despard type mounted on strap and narrow rocker for tumbler switch plates. A specification grade switch, 15 and 20 amps. 120/277 volts A.C.

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EPOXY RESIN IN TUBES!

Advantages of METALSET® A4

- No solvent to cause shrinkage
- Hence, use it in *any* thickness, all at one time
- Adhesive: to steel, iron, aluminum, glass, and all porous materials like wood and ceramics
- Hard: can be drilled and tapped
- Stable: waterproof, oilproof, chemically resistant
- Flexibilized against thermal and mechanical shock
- Not only is revolutionary epoxy-resin cement easy to use:—Metalset A4 is non-flammable, hardens at room temperature, and is made with minimum-toxicity materials only

Just squeeze equal lengths from each tube. Mix. Use. Take only what you need. Keep what's left for the next job.

Typical Applications

- Stops leaks in pipes, tanks, concrete
- Bonds metal to metal, wood, concrete
- Smooths and fills dents in sheet-steel and aluminum
- Sets loose parts tight
- Caulks windows, roof fixtures, sidewalk elevators

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For more facts circle 641 on Reply Card

One **RUGGED** Swivel Construction * for a whole range of **CASTER DESIGNS**

. . . assures dependable, low-cost materials handling

The 900 Series Caster and its variations—featuring *2 full rows of ball bearings* rolling in *2 separate, hardened enclosed raceways,* for easy swiveling, heavy gauge steel horn and top plate for extra strength—are examples of the variety and scope of the Faultless line. Whatever *your* material handling problem—Faultless, the "Complete Line" backed by nearly three-quarters of a century of caster-making experience, assures you the Caster to best do your job.

NØELTING **Faultless** Casters

Faultless 900 Medium-Heavy Duty Caster

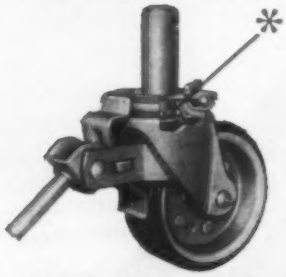
The 900 Series is a rugged, all-purpose Caster with Double Ball Bearing Swivel that out-performs the ordinary kind. Full drawn steel horn formed for surplus strength. Complete selection of wheels to suit floor surfaces, loads and operating conditions make it the ideal choice for use wherever high quality Industrial Casters are needed for medium-heavy duty applications.

Faultless 900GS Caster with Triple Grease Sealed Bearings

Dirt Can't Hurt It!

900GS combines dependable Faultless Double Ball Bearing Swivel construction with triple grease seals to give positive protection to swivel and wheel bearings wherever dirt, steam, chemicals are encountered—minimizes "down-time." Choice of hard and cushion tread wheels in sizes and capacities from 240 to 650 lbs. per caster.

Faultless C900 Scaffold Caster with Double Safety Locks



Protects Workers on Mobile Equipment

C900 Scaffold Caster combines an easy-to-use foot-operated brake lever which simultaneously locks both swivel and wheel and famous Faultless Double Ball Bearing Swivel construction—assuring safe and positive handling of mobile equipment holding workmen—making it the ideal caster for industrial, military and construction equipment.

WRITE FOR FREE LITERATURE

ASK YOUR DISTRIBUTOR Your nearby Faultless Industrial Distributor maintains a substantial inventory of Faultless Casters for immediate delivery. He and one of the strategically located Faultless Sales Engineers are available to work with you on every handling problem in your plant. Both are listed in the phone book Yellow Pages, under "Casters," and the Faultless heading.

Faultless Caster Corporation
Evansville 7, Indiana

Please send information on the following casters:

☐ 900 Series ☐ 900GS Grease Sealed ☐ C900 Scaffold

Name_____ Title_____

Firm_____

Address_____

City_____ Zone____ State_____

For more facts circle 642 on Reply Card

NEW PRODUCTS

(Begins on page 170)

air to enter the exhaust fan. An economy feature of this washer is low water consumption—about 1 gal per 1000 ft of air handled. Additional economy in installation is announced, as these washers weigh about 1/6 as much as steel units of comparable capacity—no additional building supports needed for roof installations. Industrial Plastic Fabricators, Inc.

79—FIRE EXTINGUISHER is easily used, spherical unit

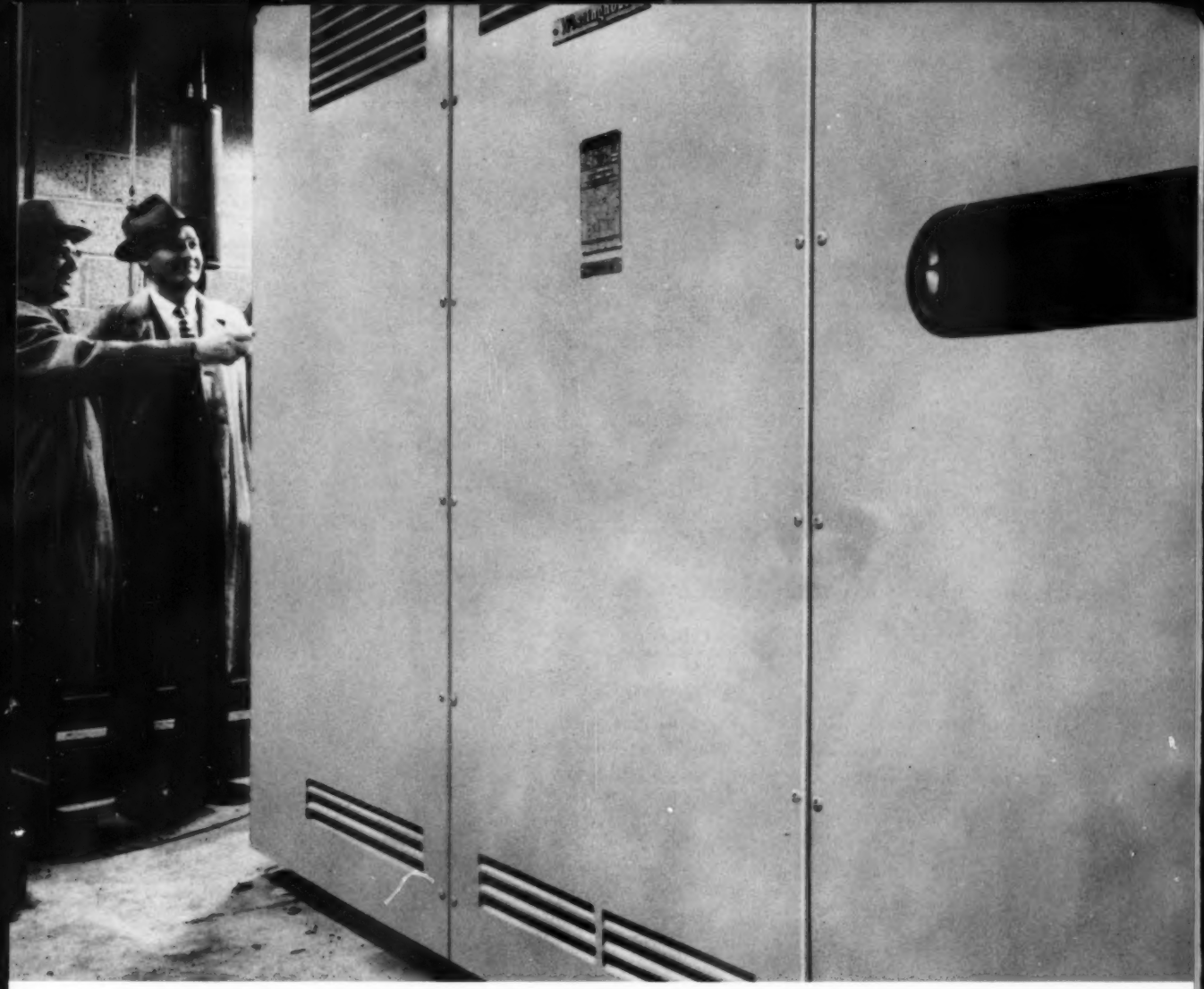
Resembling a red cannon ball, the Monitor features spherical design, one-hand operation, and disposable cartridge. This multi-purpose fire extinguisher is a 2½-lb dry chemical unit and can be placed in almost any location. Manufacturer points out that the dry chemical recharge unit is UL

approved and the spent cartridge (the "ball") can be replaced immediately. The cartridge remains charged indefinitely providing it is not punctured. The Monitor's hanging bracket serves as a locking device to avoid accidental discharge. When removed from the bracket it's set for use—a squeeze of the trigger-grip releases a stream of dry chemical. Rated effectiveness of the Monitor is claimed equal to eight pump type, 1-qt carbon tetrachloride extinguishers. Ansul Chemical Co.

80—BTU METER measures heating, cooling

The Pollux Heat Pump Btu Meter is introduced for measuring both heating and cooling consumption in commercial plant installations, but is adaptable to many kinds of process work. The meter enables charging for both heating and cooling from a central heat pump installation through a single meter and in exact proportion to what each area uses. It is designed to measure in Btu's the amount of heat absorption or cooling at the point water enters and leaves an area.

For more facts circle 643 on Reply Card ⟶



These school board members, Treasurer W. R. Pool (left) and Mr. Harrison C. Kennedy, are enthusiastic about the safety and compactness of the Westinghouse Ventilated Dry-Type Power Center installed in Hickory Township High School, Hickory Township, Pennsylvania.

From the Westinghouse Full Line...

VENTILATED DRY-TYPE POWER CENTERS SERVE SCHOOLS SAFELY

For indoor installations—like this one at Hickory Township High School—where safety is a major factor, consider the advantages of Westinghouse Ventilated Dry-Type Power Centers.

Over 20 years' reliable, trouble-free service—in schools, hospitals, factories, institutions, airports, office buildings—have proved these Power Centers inherently safe . . . for personnel and equipment.

Westinghouse has a full line of self-contained Power Centers—one to fit every application, any installation. Whatever your power distribution problem—whether a change-over to higher voltage or a complete modernization of existing facilities—this full line makes it easier, more economical to POWER-UP for greater production, greater efficiency.

Any location—indoors or out, safe or hazardous, clean atmosphere or dust-laden—can be served better with a Westinghouse self-contained Power Center . . . ventilated dry-type, sealed dry-type or liquid immersed.

Interested in savings, too? . . . See overleaf:

YOU CAN BE SURE...IF IT'S

Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

Architect Walter H. Frost (left), of Kling and Frost, Youngstown, Ohio, and Consulting Engineer F. E. Sturgeon, Grove City, Pa., with Hickory Township High School's new Power Center, a Westinghouse 3-phase Type ASL, rated at 500 kva, 12,470 to 208Y/120 volts, 60 cycles.

SAFETY... PLUS LOWER SOUND LEVELS, LOWER INSTALLATION AND MAINTENANCE COSTS

Safety of Westinghouse Ventilated Dry-Type Power Centers is inherent in their construction. With air-insulated core and coils, there is no danger of explosion . . . very low fire hazard.

Lower sound levels

These power centers are now available at reduced sound levels—up to 9 db below standard NEMA levels—making them even more suitable for indoor installations.

Lowest installation costs

These units can be installed virtually anywhere. No special safety precautions are required—no vaults, pressure-relief devices, outside venting, gas-absorbing equipment, catch basin or drains. Installation space is 35% less than for Inerteen®-filled units. Low weight makes balcony mounting practical, saving valuable floor space.

Lower maintenance costs

Maintenance cost is considerably less than for liquid-filled units. There are no gauges, valves or gaskets to maintain, no liquids to handle or recondition.

Single responsibility

Westinghouse assumes full responsibility for engineering, manufacturing and field service for every Westinghouse self-contained Power Center—and for each component.

Ask your Westinghouse distributor or local representative for the full story of the Ventilated Dry-Type Power Center . . . or the particular Power Center from the Westinghouse full line that best fits your needs. JI-70905

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Built to take IMPACT

How much "smack" can your floors take without damage or disintegration? Duraco with its all-vinyl binder is built to take it – to really stand up under the bruising impact of dropped objects and rolling friction.

This remarkable industrial flooring is built to do a better job in plant and factory areas. It's greaseproof and acid-resistant – easier and safer to walk and work on – much easier and quicker to clean. It's the answer to lower floor costs per square foot per year in your plant. Let Duraco prove itself in your plant without obligation to you. Our representative will be glad to discuss the details of the Duraco Test Area Program with you.

SPECIFICATIONS

Available in 5 terrazzo colors, 5 marbleized colors – coordinated with accepted industrial color standards. Size 9″ x x9″. Thicknesses: Standard Gauge 3/32″ – Heavy Gauge ⅛″.

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For more facts circle 644 on Reply Card

NEW PRODUCTS

(Begins on page 170)

A mechanical device, this meter consists of a liquid meter, an integrator and temperature sensing bulbs in the supply and return lines. The difference in water temperature between supply and return lines is multiplied mechanically by the integrator with the flow of water which has been converted to net weight. The result in Btu's is shown cumulatively on a digital counter. One dial shows heating, a second cooling, depending on cycle in use. Also shown is instantaneous temperature. The meter automatically changes from heating to cooling. Air Conditioning Equipment Corp.

81—ALUMINUM PIPE utilizes variable wall principle

Unistrength Pipe is described as a low-cost, seamless, one-piece pipe combining thin walls with a standard wall thickness at pipe ends. The resulting weight reduction is reflected in lowered costs. At the same time, manufacturer says, variable wall principle strengthens joints, usually the weakest link in a piping system, by concentrating metal at pipe ends. The pipe is adaptable to all joining methods, and is available in 40-ft lengths with schedule 40 wall thicknesses at the ends, permitting use of standard aluminum fittings and flanges. Aluminum Co. of America.

82—TINY CALCULATOR solves math problems fast

Only 3½ in. in diameter, the Cal-Math is a simplified, circular slide rule consisting of two flat metal discs, plus a sliding indicator. It multiplies,

divides, calculates discounts and percentages, solves problems in square and square roots, cube and cube roots, fractions, decimals, proportions, succesive multiplication and division, problems using pi. Cal-Math is claimed unaffected by atmospheric corrosion, perspiration and fingering. It comes in a plastic case, retails for around $5.00. The Cal-Math Co.

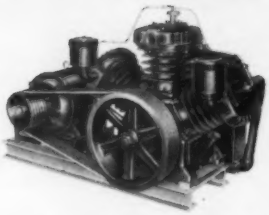
83—BATTERY CHARGERS offer cost, space savings

These constant-voltage battery chargers with generators, motor and control panel in one unit are reported to save up to 42 per cent in cost, 34 per cent in required floor space over comparable models with separately mounted components. For switchgear, emergency power and lighting, etc., they utilize a diverter-pole armature design in which series-wound intermediate poles and magnetic bridges between main shunt-wound poles compensate for load changes to maintain constant voltage without external regulators. Electrical loads beyond safe capacity of generator are shifted automatically to battery.

The new models eliminate cost of separate component installations. And with controls mounted on the unit, the control panel need not conform physically to standard switchboard installations. Also these chargers do not require walk-space between panel and motor-generator for servicing. Seven sizes offer ratings from 1 to 10 kw. Exide Industrial Division, The Electric Storage Battery Co.

Where the going is TOUGHEST the Curtis keeps going!

Sandiest FOUNDRY conditions haven't stopped this CURTIS AIR COMPRESSOR



The CURTIS C-100 two-stage air-cooled air compressor. 25-30-40 H.P.

- CURTIS-SEAL CRANKCASE
- TIMKEN MAIN BEARINGS
- SELF CENTRO-RING OILING
- AIR COOLED: NO COOL WATER REQUIRED
- PRECISION BUILT

For compressed air—industry depends on *Curtis*. Eliminate production line delays. Get more air faster . . . at lower cost. Where the going is toughest (foundry, factory or shipyard) put the CURTIS C-100 to work and forget it!—Full line of industrial compressors for ordinary and special applications.

For complete information write for illustrated folder.

OUR 105th YEAR

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Write Dept. 46, St. Louis 20, Missouri C-62

For more facts circle 645 on Reply Card

For more facts circle 646 on Reply Card →

U.S.S. Skipjack slides down the ways at General Dynamics' Groton, Connecticut, yard to join sister ships Nautilus and Seawolf. Garlock Spool-Type Rubber Expansion Joints (below) prevent noise and vibration in Skipjack's water and condensate lines.

NOW 3 ATOMIC SUBS STOP NOISE AND VIBRATION WITH GARLOCK RUBBER EXPANSION JOINTS

Aboard the U.S.S. Nautilus, Seawolf, and Skipjack, Garlock All-Rubber Expansion Joints prevent noise and vibration in water and condensate lines . . . help maintain smooth and silent service on atomic subs.

Garlock All-Rubber Expansion Joints react to the slightest pressure; this relieves any stress on expensive piping. Moreover, they are reinforced with steel rings, thus assuring greater strength. They are recommended for use against water, oil, mild acids, gases, and exhaust steam. Garlock has Rubber Expansion Joints ¾" to 72" in dia.; in round, rectangular, tapered, and offset spool types or U types.

Rubber Expansion Joints are another important part of "the Garlock 2,000" . . . two thousand different styles of packings, gaskets, and seals for every need. Ask your Garlock representative for his recommendations, or write for Folder AD-137.

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For Prompt Service, contact one of our 30 sales offices and warehouses throughout the U. S. and Canada.

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Plastics Division: United States Gasket Company

NEW BOOKS

for the plant engineer

Construction Financial Control

CONSTRUCTION ACCOUNTING AND FINANCIAL MANAGEMENT by Wm. E. Coombs. Size 9¼ by 6¼ in.; 490 pp; illustrated; paper bound. Published by F. W. Dodge Corporation, New York 18, N.Y. Price $12.95.

AUTHORED by a person who is a lawyer and an accountant with experience in construction activities, this book presents material that may be of interest to plant engineers who are exposed to contract work. Even though the book is of primary interest to people in the construction business, it can be useful in familiarizing other readers with the many details of record keeping and accounting pertaining to construction work.

In addition to other topics, the book deals with such items as accounting for materials and supplies, equipment costs, overhead; financial and cost reporting; insurance problems and job accounting; effect of personnel policies on job accounting and reporting; applications of accounting machines; and reviews the various accounting methods which can be employed.

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...featuring flat radial blade wheels
Workhorse durability plus precision machine efficiency equals BIG performance. All new G. I. Fans incorporate advanced aerodynamic techniques that combine improved efficiency with all the advantages of the flat radial blade design. Three wheel types are offered to provide rugged performance for virtually any type application.
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Pipe Drafting

FUNDAMENTALS OF PIPE DRAFTING by Charles H. Thompson. Size 11 by 8½ in.; 63 pp; 1958 edition; illustrated; paper bound. Published by John Wiley & Sons. Inc., 440 Fourth Ave., New York 16, N.Y. Price $3.50.

PIPE DRAWINGS call for a specialized drafting approach with its own symbols and ways of handling details. The author who has taught piping drafting over many years presents some helpful light on the subject through the selective material in this booklet.

Among the topics treated in this publication are the following: methods of representing piping symbols; diagram drawing; pipe and pipe fittings; specification of parts; and controls.

The section on controls contains numerous illustrations of different types of valves. In the appendix of the booklet is a nomenclature of piping terms. Practice problems are also included in the publication.

Plastics Application Series

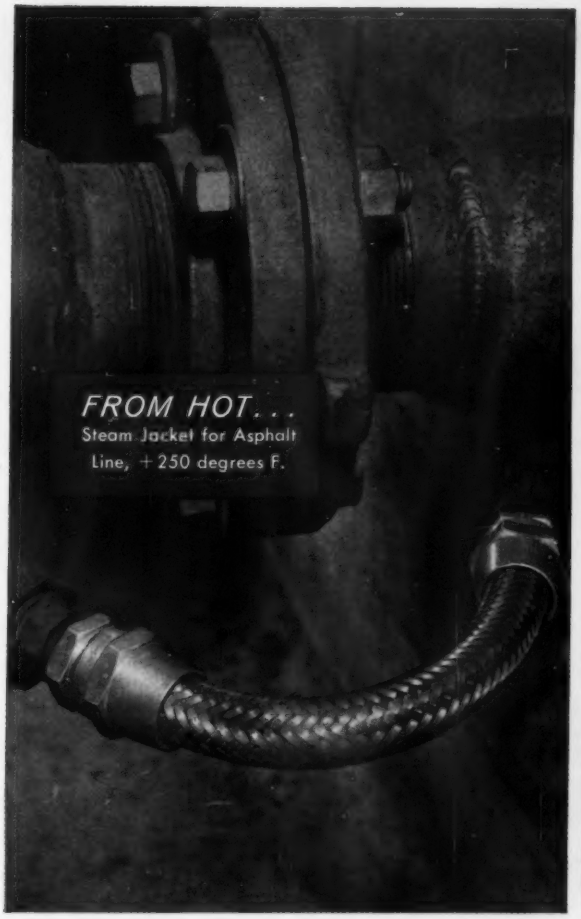
THIS BOOK series, published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N.Y., consists of several short books dealing with the various families of plastics. They are semi-technical in nature—written so that the reader need not be a chemist to understand the terminology.

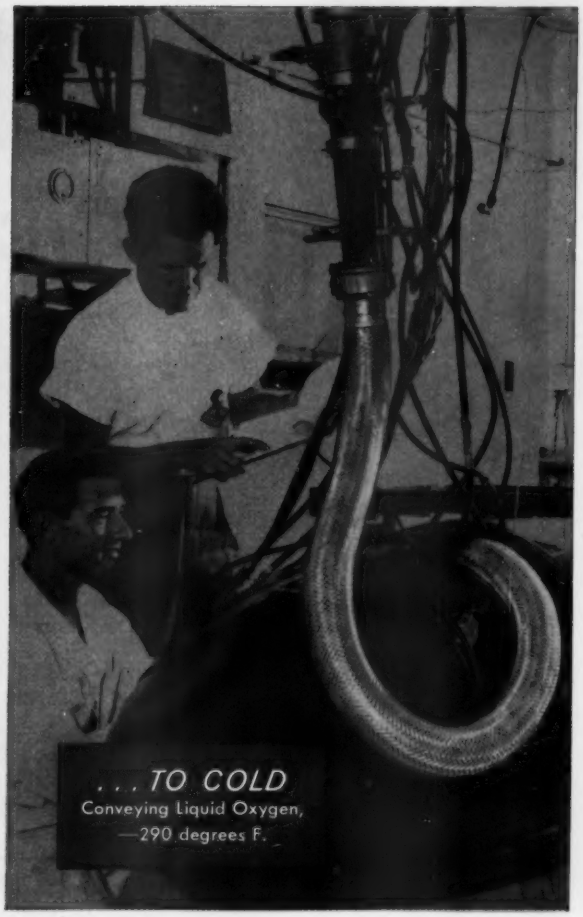
Each of the volumes is similar in size (7½ by 5½ in.) and approach. Coverage includes the general properties of the plastic or plastics in question, the basic chemistry of their formulations, the primary manufacturing processes, the scope of each material's applications, and the future of the particular plastic in the widening plastics market.

POLYURETHANES by Bernard A. Dombrow; 176 pp including index; price $4.50. This book deals primarily with urethanes in their best-known application—foams. Rigid foams in structural parts, semi-rigid foams (foamed in place) and flexible foams are discussed. The text also includes the use of urethanes in coatings, rubber and adhesives.

POLYAMIDE RESINS by Donald E. Floyd; 230 pp including index; price $4.50. This family of plastics is best known by the generic term, nylon. The materials are available as fibers, molding powders, films and coatings.

Separate chapters of the book cover





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Bring all your metal hose requirements to the one source that can meet the need *fully*—with *lower cost*, faster delivery. Whatever the medium to be conveyed, the pressure, temperature, motion or corrosive factor, FLEXONICS has the answer . . . in the construction, material and size (3/16" to 24" I.D.). Depend on this unique, full-range capability.

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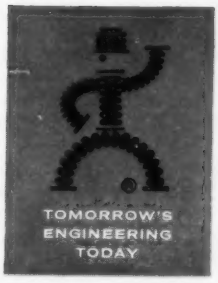

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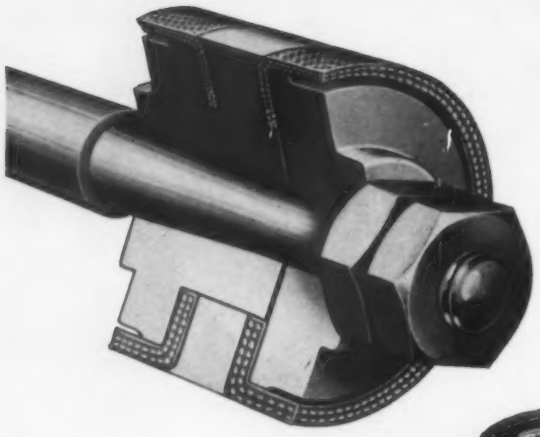
LESS FLUID SLIPPAGE!
LESS DOWNTIME!
GREATER EFFICIENCY!



Darcova Pumcup

...in hydraulic and pneumatic mechanisms, reciprocating pumps

Darcova 45° Bevel Type Pumcup

THE BIG DIFFERENCE you'll find in Darcova Pumcups is that they operate at full efficiency *throughout their entire life.* This means fluid slippage is virtually eliminated.

And because fewer replacements are necessary, you have less downtime. Users report that Pumcups *outlast ordinary packings at least 3 to 1!*

Pumcups are available in three textures—hard, medium and soft. Also in regular or 100% nylon composition. Sizes range from ¾" to 20". For all the facts on Pumcups, write for Bulletin 5503.

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DARCOVA
THE ORIGINAL COMPOSITION CUP
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PUMCUPS

NEW BOOKS

application of the polyamides in: molding, castings and extrusions; adhesives; water dispersions, organosols and inks.

FLUOROCARBONS by Merritt A. Rudner; 238 pp including index; price $5.75. Designed around the fluorocarbon industry, this book covers those thermoplastic resins in the family of Teflon, Kel-F, Fluorothene, etc. These resins exhibit properties that set them apart from most resins in current use. They will withstand higher and lower temperatures than more complex resins, are chemically inert to both acids and alkalis, display excellent moisture absorption characteristics (0.00), have better than average mechanical characteristics and electrical properties "beyond compare."

Case history material is included to assist the reader in comparisons with his own problems.

CELLULOSICS by Walter D. Paist; 270 pp including index; price $5.75. With major emphasis on applications, this volume covers the family of plastics characterized by rayon, cellophane and nitrocellulose. Extensive coverage of applications includes their use as fibers, films, molding powders, protective coatings, adhesives and thickening agents, among others.

As in the other books in this series, background chapters include properties and protection methods of these plastics, probably used in greatest variety of all polymers.

VINYL RESINS by W. Mayo Smith; 282 pp including index; price $5.75. Largest selling and most versatile family of plastics, the vinyls are covered primarily by type and application, in this book. Case history presentations include prominent industrial uses such as wire coatings, flooring, vapor and fire barrier films, paints and pipe.

Aid to Pressure Vessel Code

THE UNFIRED PRESSURE VESSEL CODE SIMPLIFIED by Robert Chuse. Size 11 by 8½ in.; 47 pp including index; illustrated; paper bound. Copies available from Robert Chuse, P.O. Box 91, Leonia, N. J. Price $6.50.

IN THIS publication is presented a simplified analysis of the ASME Unfired Pressure Vessel Code. The author of this work has code design approval experience extending over a range of many years.

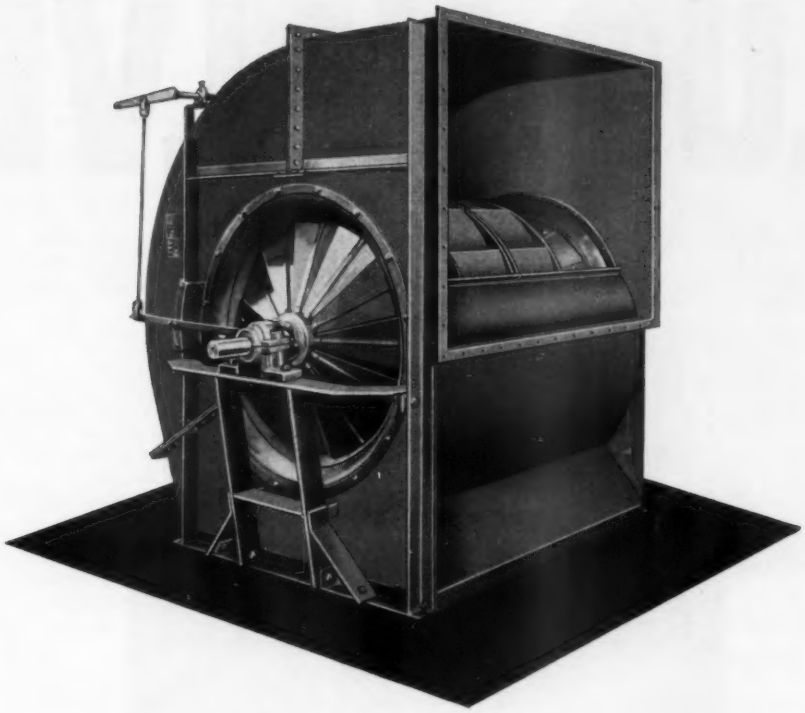
A guide at the front of the book contains in table form specific references to the 1956 ASME code pertaining to various topics that are listed.

This edition includes simplified charts on the thicknesses of the following: shells; flanged, dished, and flat heads; and flat cover plates. It also has chart on external pressures

For more facts circle 649 on Reply Card

CLARAGE

Presenting new highs in quietness and dependable broad efficiency...



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featuring a perfected airfoil blade design

With this new Clarage Type AF Dynafoil Fan you get stable high efficiency where it counts—under actual operating conditions.

Ideally suited to mechanical draft and heavy-duty applications, such as industrial processes, conduit type air conditioning, and tunnel ventilation, this latest in the Clarage line of superior fan equipment is built in 13 sizes, Classes II, III, and IV construction.

WRITE FOR CATALOG 859 which provides outlined dimensions and description of new Clarage Type AF Dynafoil Fans. Or contact nearest office.

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Kalamazoo, Michigan

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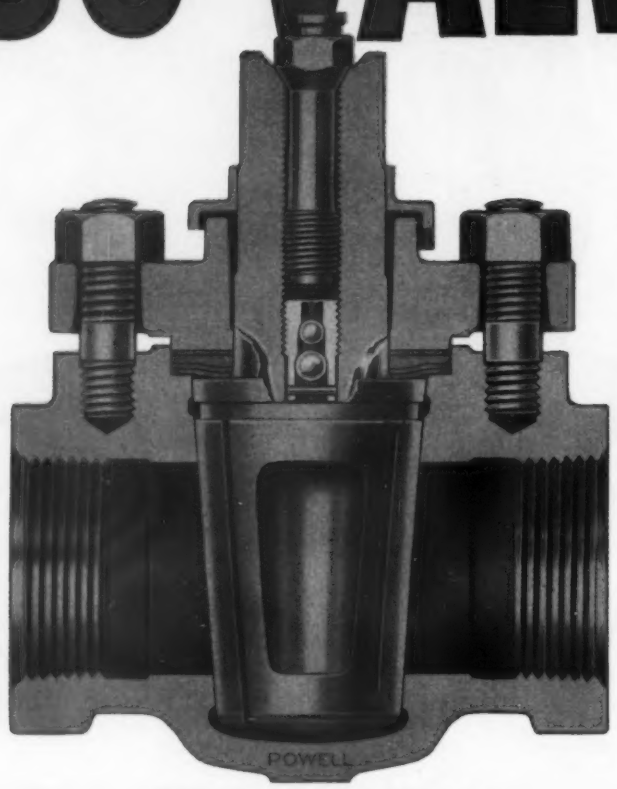
For more facts circle 650 on Reply Card

POWELL
LUBRICATED PLUG VALVES



Sectional-Powell Lubricated Plug Valves, Single Gland type. Also available with Flanged Ends.

Powell Lubricated Plug Valves have many advantages over conventional types of Valves:

- Simple design: only 3 basic parts—body, bonnet, plug.
- Quick, complete shut-off.
- Tapered Plug assures positive seating.
- Machined surfaces of plug and body are not exposed in open position.
- Cavity-free straight passage assures streamlined flow.

Available in sizes ½", through 16", depending on the type required—semi-steel 175 and 200 pounds WOG; carbon-steel ASA 150 and 300 pounds. Also in other alloys on special order.

For complete information, write for our new Lubricated Plug Valve Catalog, Number PV-5. Or contact your local Powell Distributor.

The Wm. Powell Company • Cincinnati 22, Ohio
Dependable Valves Since 1846

POWELL...world's largest family of valves

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NEW BOOKS

on heads, tables on head and shell volumes, and a brief section on Canadian pressure vessel requirements.

Welding Symbols

STANDARD WELDING SYMBOLS. Size 9 by 6 in.; 1958 edition; 93 pp; illustrated; paper bound. Available from Department T, American Welding Society, 33 West 39th Street, New York 18, N.Y. Price $3.00.

MANY ADDITIONS and improvements appear in this edition of the standard on welding symbols. Among the new symbols are those pertaining to: spot and seam welds made by arc welding; guided missile and automotive work; and structural steel fabrication.

The publication also contains letter designations for different types of cutting and welding processes. At the beginning of the booklet there is a welding symbol chart which incorporates the new developments.

Building Inspection

FIELD INSPECTION OF BUILDING CONSTRUCTION by T H. McKaig. Size 9 by 6 in. approx; 337 pp including index. Published by F. W. Dodge Corporation, 119 West 40th St., New York 18, N.Y. Price $9.35.

THIS COMPREHENSIVE book deals with many facets of building construction. It brings into focus numerous details of interest to inspectors and engineers, and also includes discussions on workmanship.

The following are the principal topics of the seven chapters in this book: the job of the inspector, preliminary structural framing, intermediate, and finishing stages, and concrete.

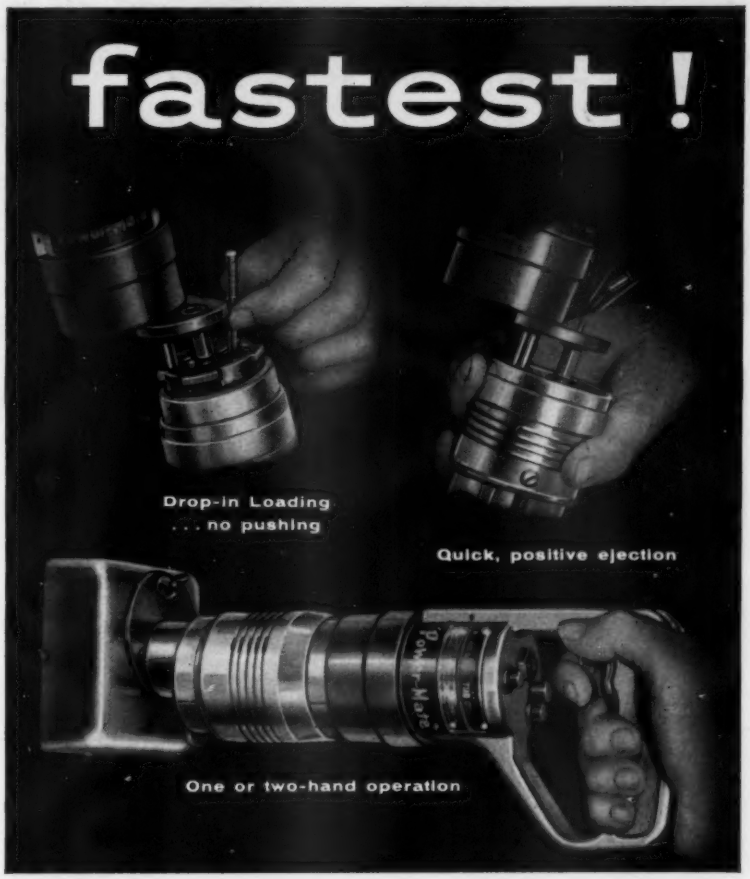
Fluid Power Symbols

GRAPHICAL SYMBOLS FOR FLUID POWER DIAGRAMS. Size 11 by 8½ in.; 16 pp; illustrated; paper bound. Available from the American Society of Mechanical Engineers, 29 West 39th St., New York 18, N.Y. Price $1.50.

CODE IDENTIFICATION of this standard which has been approved by the American Standards Association is Y32.10-1958. It is suitable for use in making drawings of closed hydraulic and pneumatic circuits.

This publication presents the various symbols which in some cases include abbreviations. Illustrations are identified by code numbers and are accompanied by interpretations. The booklet contains simple as well as composite symbols.

Remington Stud Driver



Loads in seconds . . . sets up to 9 studs a minute in concrete or steel

Here's the most efficient powder-actuated fastening tool ever designed. It's the new Remington Stud Driver with an *exclusive* combination of features that make it your best buy.

Built for speed, it has fast, easy drop-in loading. With Remington "Power-Guide" studs, no ramrod pushing of stud is necessary. Quick, positive ejection is another timesaver. A flip of the wrist and the fired cartridge pops out. With other tools the chamber bushing must be removed by hand, which is clumsy and slow. And only the Remington Stud Driver can be converted to one- or two-hand operation. No other tool has this feature.

Other advantages: Easy, fan-type opening and closing of tool and instantly interchangeable guards for greater versatility, efficiency.

Send coupon for special booklet that proves why the Stud Driver is the fastest powder-actuated tool—and best for you.

CHOOSE THE POWER MOST EFFICIENT FOR YOU. REMINGTON POWER TOOLS ARE AVAILABLE IN
AIR • ELECTRIC • GASOLINE AND POWDER-ACTUATED MODELS

Remington

DUPONT

Remington Arms Company, Inc., Bridgeport 2, Conn.
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H-4

FREE POWER TOOL CATALOGS
Remington Arms Company, Inc., Bridgeport 2, Conn.
Please send—without obligation—catalogs on Remington Contractor & Industrial Tools checked below:
☐ Stud Drivers ☐ Air Tools ☐ Chain Saws
☐ Concrete Vibrators ☐ Electric Tools ☐ Flexible Shaft Machines
*Name*_____ *Position*_____
*Company*_____
*Address*_____
*City*_____ *Zone*___ *State*_____

For more facts circle 652 on Reply Card

Galvanized Steel Sheets

(Continued from page 102)

applied at the appearance of approximately 10 per cent rust. This will result in better performance and greater economy than when the original painting is done in a two-coat system.

You may expect a service life of about seven years from one coat of MZP. If a finish coat of another color is desired, any good paint may be applied over MZP. For optimum economy and service, apply a second coat of MZP five years after the first coat. Metallic zinc paint may be applied with brush or sprayed on. It weighs about 23 lb per gallon and may be applied with a sprayer pressure of 75-80 psi.

Best job of painting can be done in warm, dry weather; the paint will spread better and dry more readily. Do not apply paint when rain is imminent or when the roof and siding are damp.

In applying metallic zinc paint with a brush, bear in mind that this paint, because of superior opacity and other qualities, should be brushed out thoroughly. A coverage of 600 to 800 sq ft per gallon is not unusual on warm, dry days.

Reduce Heat with White Paint—When temperature reduction is a consideration, as in instrument buildings, plant design should take advantage of the heat reflectivity that can be achieved by painting galvanized roofing and siding white. Although new galvanized steel is shiny and will reflect a substantial amount of light and heat from the sun's rays, tests have shown that the metal will reflect substantially more when painted white.

University of California Reflectivity Tests—Recently published reflectivity tests on painted and unpainted buildings and shades conducted by agricultural engineers on the Davis campus of the University of California report significant findings.

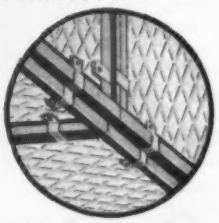
According to the findings, the temperature inside one painted steel building was calculated to be 28 deg cooler than in a similar unpainted building. Although painting the aluminum shades also brought down inside temperature—surface readings were as much as 15 deg cooler, galvanized steel shades painted white measured as much as 50 deg cooler than those not painted!

In installations where temperature control is significant, a coat of a good grade exterior white paint applied over a base coat of metallic zinc paint should substantially reduce air cooling requirements. **End**

...will answer all your enclosure problems...

Here is the new, easier, simpler method of guarding conveyors and machines and for all in-plant partitioning. Shipped READY for erection, no cutting, drilling or welding required . . . these interchangeable expanded metal panels provide greater safety, cut overall costs, cover a wider range of use and require 85% less storage space.

EXCLUSIVE QUIK-ERECT SECTION CLIPS save much of the erection time formerly required. Proven successful in hundreds of installations, these Safe•*Gard* panels are of welded construction, give longer life, are more rigid and stronger than wire, will not ravel or fray.



Note enlarged detail showing SAFE•GARD Quik-Erect Clips securely joining the interchangeable panels.

Write today for more details or call your Globe (Grip-Strut) Distributor. Distributors in all principal cities, listed under "Grating" in your phone book.

PRODUCTS DIVISION | THE GLOBE COMPANY
4014 S. Princeton Ave., Chicago 9, Ill.

For more facts circle 653 on Reply Card

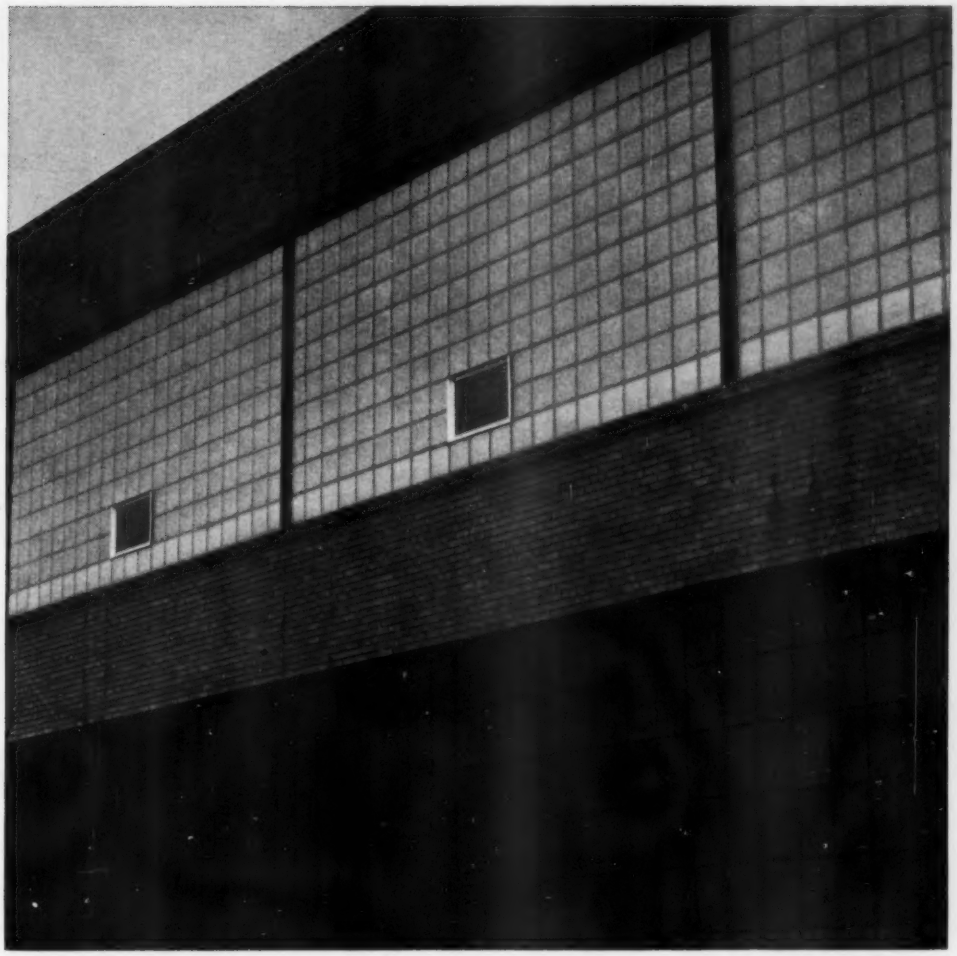
Electric Control Panels Safe?

(Continued from page 97)

to the safety or productive value of the machine. However, it should be noted that the false economy of poor grade electrical components with their accompanying high cost of maintenance is to be avoided.

These standards are not intended to limit or inhibit advancement of engineering practice in any way. They are intended primarily to pro-

THIS ▸ in place of THIS ▸



for glare-free daylight, good insulation value, low maintenance, improved appearance

Second floor modernized. First floor next. Out comes the existing sash, and in goes the clean sweep of PC Glass Blocks. Why? It makes good sense.

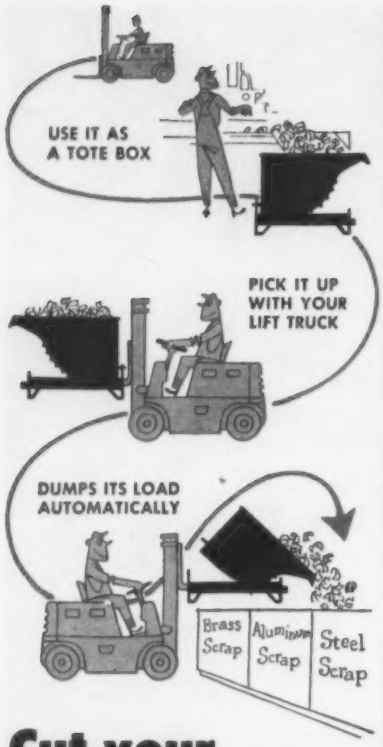
Most sash leaks dust and dirt. Heat seeps through it to cause heat loss in winter, heat gain in summer. Heating-cooling costs go up. The light it admits is harsh, glaring, hard on workers' eyes. And maintenance is costly. Constant painting to prevent rusting. Constant replacement of broken panes. Too-frequent washing.

PC Glass Blocks solve all these window area problems. They admit controlled, glare-free daylight, easy on workers' eyes. They have insulation value equal to a 12″ concrete block wall . . . helping to keep air conditioning and heating costs in line. Their high impact strength cuts breakage. Tightly sealed joints eliminate dirt infiltration. Upkeep? Occasional hosing keeps the blocks sparkling. And there's nothing to rust, nothing to paint.

When your sash reaches the eyesore stage . . . puts holes in your maintenance budget . . . think of PC Glass Blocks. Keep them in mind for new construction, too. Get details by writing Pittsburgh Corning Corporation, Dept. PG-49, One Gateway Center, Pittsburgh 22, Pa.

PITTSBURGH PC CORNING

For more facts circle 654 on Reply Card



Cut your scrap-handling costs 50%

Handling scrap metal is a simple, one-man operation when you use Roura Self-Dumping Hoppers. Place them in strategic spots for scrap collection. One man with a lift truck carries them to scrap bins or freight car . . . flips the latch and the hopper automatically dumps its load, rights itself, locks itself, and it is ready for another load. Hoppers may be labelled for different kinds of scrap for easy, profitable scrap segregation. No wonder they're cutting costs in hundreds of plants.

Forks or platform of any standard lift truck slip easily into under-frame of a Roura Hopper. Pick-up is swift and simple. Hoppers are made in five sizes, ½ to 2 yard capacity, and mounted on live or semi-live skids with choice of wheels.

They're made of 3/16" steel plate with continuous arc-welded seams. Good for years of toughest service. Standard models shipped from stock immediately. Also available in stainless steel and galvanized. Start now cutting costs with Roura.

ROURA
Self-Dumping
HOPPER

WANT DETAILS?

Clip this coupon . . . attach it to your letterhead . . . sign your name . . . and mail to . . .

ROURA IRON WORKS, INC.
1413 Woodland Ave., Detroit 11, Michigan

For more facts circle 655 on Reply Card

vide detailed specifications for the design and installation of electrical wiring and equipment so as to promote safety to operating and maintenance personnel, provide maximum productive machine life expectancy with minimum maintenance and secure ease of installation and prove-in. In addition, the standard is a step towards elimination of fire hazards and is designed to reduce engineering and design effort and lower the installation costs on plant equipment.

In our company, there is no compromise with safety, economy makes its own demands and reliability is a prerequisite to an efficient plant operation. With these basic concepts in mind and through the use of electrical standards we have derived substantial benefits based on these requirements. **End.**

Two-Way Fire Protection

(Continued from 139)

or if a defective sprinkler head goes off accidentally, the resulting flow of water closes the switch, sending a signal to an associated lamp on the control panel, and causes all alarm signals to ring.

Under normal conditions, the six zone lamps on the control panel, two wired for fire stations and four wired for sprinklers, are lighted. Upon operation of any automatic fire detector, pressure switch or pullbox, the associated zone lamp goes out and a common alarm lamp lights. Alarm bells then sound continuously until the system is reset by pushing a button located on the panel. When a fire alert sounds, it is simultaneously answered by plant engineers, maintenance men, a volunteer group of fire fighters, and by the municipal fire department.

In the event of power interruption, a trouble bell sounds and the system switches automatically to standby, trickle charged batteries. If complete power failure occurs, the standby batteries will maintain the system for up to 24 hours.

The alarm system is tested by the plant engineers every two or three weeks to insure that components and wiring are in perfect operating order. Routine service is carried out by the company's electrical maintenance department. **End**

WITHOUT HARM TO FORM OR FUNCTION

UNIBESTOS®

. . . WORLD'S FINEST PIPE INSULATION

What gives UNIBESTOS the strength and body to stand up under torturing punishment? It's the *only* pipe insulation made almost entirely of tough, long-fiber asbestos. It's *uniformly durable*—i.d. to o.d.—and this means remarkable stamina.

WORTH MORE MONEY

In passing a recent certification test at Ohio State University, a 3-section length of UNIBESTOS was boiled continuously for 72 hours, then subjected to a 24-hour period of drying. Results: no opening-up of longitudinal or butt joints; almost complete absence of fraying. It did not mush or fall away from pipe and, when dry, did not change in shape or physical characteristics. UNIBESTOS is easy to cut . . . clean to use . . . won't shrink or thermal shock!

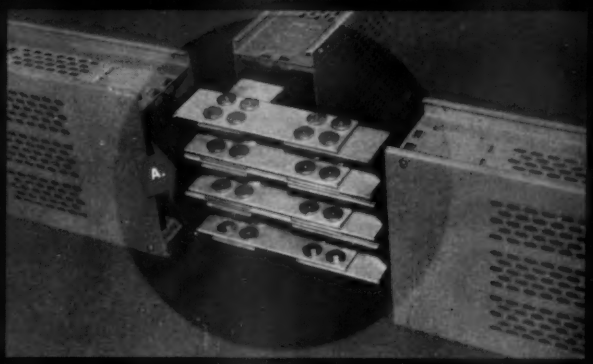
For temperatures to 1200°F.—in single-layer thicknesses to 5" and sizes to 44" o.d.

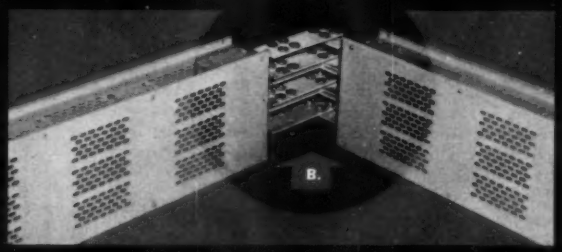
Ask for Catalog F76-321 with exclusive "J" Factor Tables.

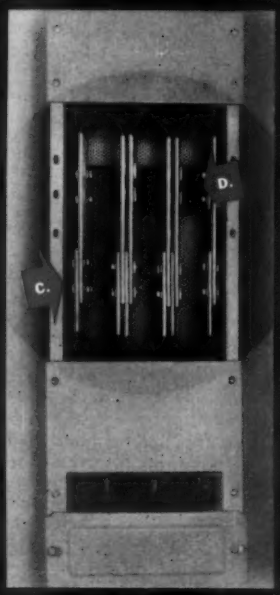
UNION ASBESTOS & RUBBER COMPANY
General Sales Offices, 1111 W. Perry Street, Bloomington, Illinois
Distributors in Principal Cities

For more facts circle 656 on Reply Card

Eliminate costly factory-built "tees" and "elbows"







Cut installation and maintenance costs

FEDERAL PACIFIC'S NEW LOW IMPEDANCE BUS DUCT features a unique splicing system which permits "tees" and "elbows" to be built up on the job site using standard bus duct sections—thus eliminating costly factory-built fittings. Result: substantially lower initial cost, no delivery delays, greater flexibility and higher salvage value. Splicing system has fewer joints. Result: faster installation and less maintenance. Available in both Feeder and Plug-in types. For complete, detailed information, write for Bulletin 3-125: Federal Pacific Electric Company, General Offices: Dept. 304, Newark 1, New Jersey.

A. "TEE" MADE FROM THREE STANDARD SECTIONS—can be either forward or rearward. Only two splices instead of three on factory-built units.

B. "ELBOW" MADE FROM TWO STANDARD SECTIONS—can be either forward or rearward. Only one splice instead of two on factory-built units.

C. FEWER JOINTS PER BUS BAR—straight lengths require four instead of six joints. On larger duct only seven joints are required instead of twelve.

D. PROVISION FOR CURRENT TAKE-OFF DEVICES—A spare set of holes is provided at each splice to accommodate future additions of current take-off devices.

FPE

FEDERAL PACIFIC ELECTRIC COMPANY

The Best in Electrical Distribution and Control Equipment

For more facts circle 657 on Reply Card

JOIN TWO LENGTHS SIMPLY BY SCREWING

No more collars or clamps! Exclusive Wiremold Air Duct construction makes possible this sure coupling method. And, air flow is not restricted. Save time; save odd lengths for neat use on next job. Why not write for full story, or ask your DISTRIBUTOR?

FOR AIR CONDITIONING / EXHAUSTING
MATERIALS HANDLING / MANY OTHER USES

WIREMOLD®
AIR DUCT

THE WIREMOLD COMPANY • HARTFORD 10, CONN.

For more facts circle 658 on Reply Card

New Plant Construction

(Continued from page 150)

electric power. Cost of expansion and modernization program is reported to be about $2 million.

Cleveland, O.—Diamond Alkali Company, 300 Union Commerce Building, this city, plans to modernize chlorine caustic soda producing facilities at company plant located at Painesville, O. Plans call for the installation of a new unit to cost approximately $2 million. Plant will be completed by the spring of 1960.

Lima, O.—Standard Oil Company (Ohio) Midland Building, Cleveland, O., plans to construct a plant for manufacturing acrylonitrile. Ground for the new facility has already been broken and the multi-million dollar plant is expected to go into production by the spring of 1960.

Portland, Ore. — Pennsalt Chemical Corp., 3 Penn Center, Philadelphia, Pa., plans a major expansion of company's perchlorate producing plant which was placed on stream here last October. New facility when completed will expand present capacity by several thousand tons. Total investment in this expansion will be $2 million.

Pittsburgh, Pa.—National Steel Corp., Grant Building, this city, plans a major steel finishing mill on a tract in Porter County, Indiana. Work will begin at once on the site and is scheduled for completion by the spring of 1962. Cost of the plant is included in a $300-million construction program that also provides for expansion of facilities at National's plants in Detroit, Mich., Steubenville, O., and Weirton, W. Va.

Tarentum, Pa.—A. P. Green Fire Brick Co., 1108 E. Breckenridge Street, Mexico, Mo., plans to construct a $2-million plant for the manufacture of basic refractories. First unit of new plant will have about 50,000 sq ft under roof and will produce a full line of basic refractories. Plant is scheduled for completion by 1960.

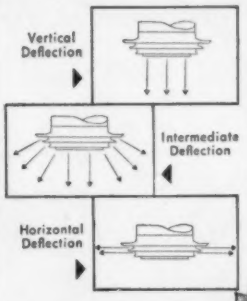
Orange, Texas—Firestone Tire & Rubber Co., 1200 Firestone Parkway, Akron, O., plans to construct a plant to produce synthetic rubbers, Diene and Coral. Work will begin at once for completion in about two years. Plant will have a capacity of 30,000 tons of either product a year since both types can be produced in the same plant.

Paris, Texas—Mansfield Tire & Rubber Company, 515 Newman Street, Mansfield, O., plans to construct a plant for the manufacture of tread rubber on large building site recently acquired. Work on the facility will begin at once and plant, when completed late in 1960, will have a monthly capacity of approximately 750,000 tons of tread rubber. Plant will represent an investment in excess of $1 million.

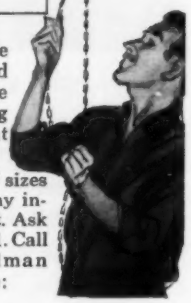
Fresh air at working level improves employee efficiency

Barber-Colman industrial Venturi-Flo diffuser permits air to be introduced at the worker's level—duct work can be extended to provide a 10' mounting height. This prevents stagnant, smoky air, which has collected near the roof, from being mixed with the incoming fresh air. Employee comfort and efficiency are improved considerably.

The Venturi-Flo industrial diffuser can be adjusted easily from the floor to deliver any air pattern. In warm weather, the air should be delivered close to, or even directly at, the worker; while during cool evenings, or



in cold weather, the air should be diffused above the head of the worker, providing ventilation without drafts.



A complete range of sizes available to meet any industrial requirement. Ask for Bulletin F-7722-1. Call your Barber-Colman Field Office or write:

BARBER COLMAN
BARBER-COLMAN COMPANY

Dept. P, 1139 Rock Street, Rockford, Illinois

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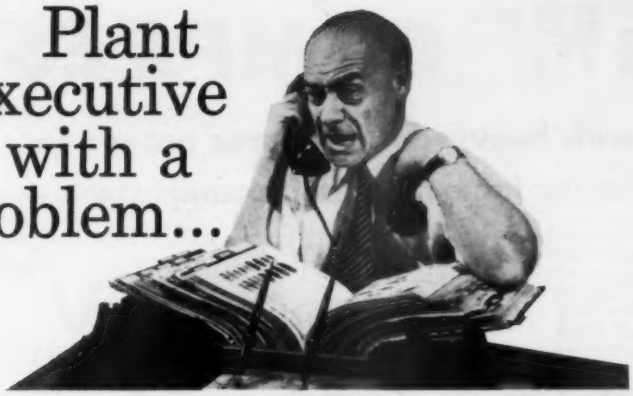
Plant executive with a problem...



Edwards modern signaling systems can make him smile again!

If it's an industrial control, communication or protection problem, better days are on the way! All he has to do is hang up one of those phones and call his nearest Edwards electrical distributor. It makes sense to check the advantages inexpensive Edwards signaling systems provide industrial plants in efficiency, safety, and maintenance savings. And there's no better time to do it than plant modernization time. Why not call *your* Edwards distributor today. He will be glad to survey your plant and recommend the signaling products that can best solve your own particular problems, and make your plant a safer, more efficient, more economical operation. His services are fully backed by Edwards technical representatives in all major cities.

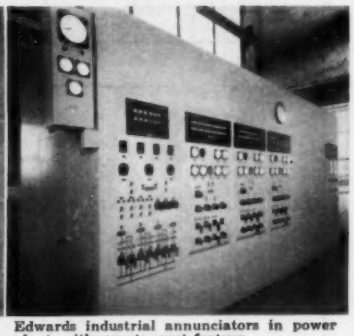
And while you're at it, ask him for your copy of the Edwards Industrial Signaling Log—a concise, informative booklet covering all aspects of industrial signaling products and what they can do for you.

Strategically located manual coded stations combined with ceiling-mounted, automatic fire detectors provide 24 hour protection.

LOKATOR master selector unit — installed convenient to regular switchboard for ease in paging key personnel.

Program unit of an Edwards Clock and Program System. Your own personnel can change schedules in a matter of seconds.

Industrial chime for plant paging, installed below Edwards clock.



Edwards industrial annunciators in power plant, with remote reset feature.

CONTROL • COMMUNICATION • PROTECTION

EDWARDS

Specialists in signaling since 1872

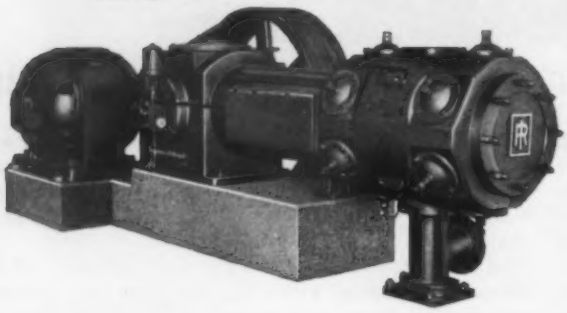
EDWARDS COMPANY, INC., NORWALK, CONN. (IN CANADA: EDWARDS OF CANADA, LTD, OWEN SOUND, ONTARIO)

For more facts circle 660 on Reply Card

NEW COMPRESSORS

...with heavy-duty features proven in larger Ingersoll-Rand compressors

ESH* (horizontal)

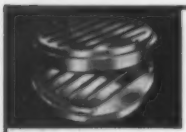


ESV* (vertical)

*The same compressor in either horizontal or vertical arrangement – 20 to 150 hp sizes, single-and multi-stage, pressures up to 5000 psi and vacuums.

Full-floating aluminum bearings never need adjustment

The full-floating bearings "roll with the punch," taking each thrust on a different portion of the shell. They are foolproof, and never require fitting or adjustment. Main and crankpin bearings are made of I-R's special aluminum bearing alloy, which has higher load capacity and better heat conductivity than other bearing materials.



Air-cushioned Channel Valves give unmatched performance

Known the world over for lasting efficiency, dependability and quiet operation, Ingersoll-Rand air-cushioned Type A Channel Valves are entirely different in design and principle from any other valves in use. Type A Channel Valves were developed especially for modern compressor speeds, and feature a separate stainless-steel seat plate which can be reversed or replaced for new life.

Never a need for adjustments– frame is kept sealed!

Here's an entirely new line of compressors, built to run longer — much longer. They're more compact, more efficient, and require less attendance, less maintenance. They offer greater capacity in less space, and are ruggedly built and highly refined to take years of continuous hard service.

All running parts are precision-machined and need no fitting or adjusting, so the frame is sealed — dirt stays out, and the major causes of wear are eliminated!

There are many design features—including filtered force-feed lubrication and full-floating self-adjusting metallic packing — that have heretofore been found only in larger Ingersoll-Rand compressors. Let your I-R representative tell you more about these new compressors, and how they can save you money.

Ingersoll-Rand

I-815 11 Broadway, New York 4, N. Y.

In engineered products, there's no substitute for experience!

COMPRESSORS • GAS & DIESEL ENGINES • PUMPS • AIR & ELECTRIC TOOLS • CONDENSERS • VACUUM EQUIPMENT • ROCK DRILLS

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BARRINGTON, ILL.

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PLANT ENGINEERING
308 East James St.
BARRINGTON, ILLINOIS

April, 1959
This card good only until
July 31, 1959

PLANT ENGINEERING

Please have manufacturers send without obligation information or bulletins indicated by numbers circled.

(Please print or typewrite)

Your Name..... Your Title.....

Your Company Name.....

Company Address..... City..... State.....

(Company name must be given. If you prefer delivery at home, also fill below)

Home Address..... City..... State.....

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8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49
50	51	52	53	54	55	56
57	58	59	60	61	62	63
64	65	66	67	68	69	70
71	72	73	74	75	76	77
78	79	80	81	82	83	84
85	86	87	88	89	90	91

BULLETINS

101	102	103	104	105	106	107	108	109	
110	111	112	113	114	115	116	117	118	
119	120	121	122	123	124	125	126	127	
128	129	130	131	132	133	134	135	136	
137	138	139	140	141	142	143	144	145	
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155	156	157	158	159	160	161	162	163	
164	165	166	167	168	169	170	171	172	
173	174	175	176	177	178	179	180	181	
182	183	184	185	186	187	188	189	190	
191	192	193	194	195	196	197	198	199	
200	201	202	203	204	205	206	207	208	
209	210	211	212	213	214	215	216	217	

DATA FILE

301	302	303	304	305	306	307	308	309	310	311	312	313	314	315
316	317	318	319	320	321	322	323	324	325	326	327	328	329	330
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ADVERTISED PRODUCTS, SERVICES

501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532
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22	23	24	25	26	27	28
29	30	31	32	33	34	35
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64	65	66	67	68	69	70
71	72	73	74	75	76	77
78	79	80	81	82	83	84
85	86	87	88	89	90	91

BULLETINS

101	102	103	104	105	106	107	108	109	
110	111	112	113	114	115	116	117	118	
119	120	121	122	123	124	125	126	127	
128	129	130	131	132	133	134	135	136	
137	138	139	140	141	142	143	144	145	
146	147	148	149	150	151	152	153	154	
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BULLETINS

(Begins on page 27)

GENERATORS, AUXILIARIES

145 **Packaged Generators**—Booklet PG-58-2, on packaged steam generators, covers features, standard and optional equipment, capacities and dimensions. Foster Wheeler Corp.

146 **Package Steam Generator**—This illustrated folder describes in detail features and advantages of company's line of package steam generators. Cyclotherm Div., National-U. S. Radiator Corp.

147 **Steam Atomization**—Bulletin 1252 describes a package firetube boiler with steam atomization designed for burning low-cost heavy oils. Advantages and operation of the atomizing burner are detailed, and a cutaway showing features of the steam/air atomizing nozzle is included. Orr & Sembower, Inc.

148 **Vapor Drum Boilers**—Sixteen-pp Bulletin 491 shows recent industrial installations featuring the drum modulatic water tube boiler. The story of each installation is told in photos and captions showing how heating problems were solved by single and multiple boilers, both low and high pressure systems. Vapor Heating Corp.

149 **Firing Units**—Bulletin 28 describes steam atomizing packaged firing units for oil and/or gas fuels. Gives advantages of the units, specifications and general dimensions. National Airoil Burner Co., Inc.

150 **Fuel Oil Heaters**—Eight-pp Bulletin 585 gives specifications on fuel oil heaters used on the suction side of pumps for heating such viscous fluids as Bunker C oils, asphalt etc. to make them more pumpable. Two principal types covered are tank suction type heater and line type heater. Brown Fintube Co.

METALS, PRODUCTS

151 **Mill Products**—This 18-pp aluminum mill products bulletin gives specifications for alloys and forms of aluminum available from company. Includes details on advantages, alloy and temper designations, fatigue and shearing strengths, fabricating and finishing techniques, and describes various alloys available in foil, sheet and plate, wire, rod and bar, tubing and pipe, and extruded and structural shapes. Reynolds Metals Co.

152 **Tool, Die Steel**—Twelve-pp Bulletin TS-101 describes a low temperature, air hardening tool and die steel. Contains complete technical data on machining, heat treatment, mechanical and fatigue properties. Universal-Cyclops Steel Corp.

153 **On Stainless Tubing**—This 10-pp report covers a successful application of light wall stainless steel tubing for main surface condensers in power plants. Combines interpretive text material, tabular test data and performance graphs on an installation. Stresses stainless' resistance to corrosion, erosion. Alloy Tube Div., The Carpenter Steel Co.

BUILDING AND EQUIPMENT MAINTENANCE

154 **Painting New Plaster**—How to paint new plaster successfully is described in this 6-pp booklet. Discusses two basic steps—determining the condition of the wall, and selecting the proper paints for each condition. The National Paint, Varnish and Lacquer Association.

155 **Industrial Steam Cleaners**—Advantages of cleaning with steam are illustrated and described in this 6-pp bulletin. Applications for heavy-duty production cleaning, paint-stripping, phosphatizing are detailed and complete specifications on the portable cleaning units are included. Turbo Machine Co.

156 **Industrial Brushes**—Containing over 40-pp of industrial brush illustrations and descriptive text, Catalog BB-83 offers comprehensive guide to brush selections for all types of industries. In a broad coverage of fibers, materials and manufacturing methods, brushes illustrated and described in the catalog are designed for almost every type of industrial application. Braun Brush Co.

157 **For Corrosion Prevention**—Bulletin 93XG describes a metallizing system consisting of a series of techniques developed through the use of treated pure metals bonded to a steel base by metallizing. Advantages and typical applications on a broad range of equipment and structures. Metallizing Engineering Co., Inc.

158 **To Combat Abrasive Wear**—What abrasive wear is, its economic significance, and how to combat it with molybdenum-containing materials are described in this 36-pp bulletin. Describes three general types of abrasive wear—gouging, grinding, and scratching. Selection of material for particular types and conditions of wear is also covered. Climax Molybdenum Co.

159 **Wear-In Compound**—Bulletin 120 describes a wear-in compound designed to eliminate damage due to improper breaking-in of new or rebuilt machinery and protect against galling, seizing, scuffing, scoring, tearing, scratching and excessive abrasion. Selection information included. The Alpha-Molykote Corp.

LIGHTING

160 **Emergency Lighting**—Illustrated and described in 8-pp Catalog 12 are units designed to provide emergency lighting instantly and automatically whenever a power failure plunges an area into darkness. Descriptive details on various types of units included. Electric Cord Co.

161 **Color-Coded Fixtures**—Described in 8-pp File 4 is a line of color-coded industrial lighting fixtures designed to direct and protect workers. Includes photos, lighting data, engineering information and complete descriptive data on luminaires and reflector units. The Edwin F. Guth Co.

ELECTRICAL

162 **Distribution Transformers**—Comprehensive technical specifications and other design and operating data on company's dry-type distribution transformers are presented in 28-pp Catalog 500. Catalog data covers dry-types, both single and three phase, to 500 kva, to standard ratings and voltages. Hill Transformer Co., Inc.

163 **Substation Transformers**—Eight-pp Bulletin CS-701 covers single and three phase substation transformers up to and including 10,000 kva through 69 kv. Illustrated bulletins details construction features, standard and optional accessories. Kuhlman Electric Co.

Postage-free Reader Service Cards make it easy to order bulletins. Cards are provided on the facing page.

164 **Vapor Cooling**—Discussed in 8-pp Booklet B-7602 is the subject of vapor cooling for transformers. Covers both principles and practice. Comparison data on vapor cooling and air cooling included. Westinghouse Electric Corp.

165 **Metal-Enclosed Bus**—Ratings and construction details of a isolated phase and nonsegregated phase metal-enclosed bus and bus auxiliary equipment are presented in 20-pp Bulletin 2604-1A. Contains a section on simplified planning procedure, as well as specifications, dimensions, and other data. I-T-E Circuit Breaker Co.

166 **Primary Distribution System**—Proper installation of a primary overhead insulated distribution system is detailed in 20-pp Bulletin RCP-790. Includes data on each component, as well as step-by-step instructions for proper installation, splicing and termination, tables of electrical and physical characteristics of the conductors. Rome Cable Corp.

167 **Motor Controls**—This profusely illustrated Quick Selector Chart is designed to simplify and speed the selection of motor controls. Information includes motor control ratings, sizes, features, catalog numbers, ordering information, and listing of standard heater tables. Industrial Control Div., The Arrow-Hart & Hegeman Electric Co.

168 **Circuit Breakers**—Specifications and construction details on company's circuit breakers are provided in this 8-pp illustrated bulletin.

BULLETINS

(Begins on page 27)

Simplified for easy selection, bulletin presents high rupture capacity breakers, miniature size breakers and commercial type units. Wood Electric Co.

169 **Safety Switches**—Design and operation information on company's line of safety switches with Clampmatic action is presented in 16-pp Bulletin SS-260. Gives horsepower and short circuit ratings, dimensional and knock-out data, and includes dimensional diagrams. Bulldog Electric Products Co., Div. I-T-E Circuit Breaker Co.

170 **Instrument, Control Switch**—Construction features of Type 210 instrument and control switches and their advantages are described in Bulletin 14B8112B. Dimensional data included. Allis-Chalmers Mfg. Co.

Motor Selection Aids

171 **FHP Motors**—Twelve-pp Bulletin S-1 lists and describes reducer and nonreducer fhp motors of various types and sizes. Gives tables of ratings, capacitor data, dimensional data and diagrams. Bodine Electric Co.

172 **Motor Selection**—Bulletin B-2103-4 gives concise selection data on a-c motors from 1 through 200 hp. Includes explanations of design classes, speed-frequency relationships, current and torque valves, as well as frame selection tables and complete dimension information and mechanical modifications possible. Reliance Electric and Engineering Co.

173 **Motor Application Guide**—Sixteen-pp Form 270-A describes nine major factors in motor selection. Includes polyphase, single phase and direct current motor selection charts which describe typical motor driven equipment, show starting and running torques, load characteristics, type of motor to use, starting currents, speeds, capacity, available enclosures, performance data and mounting specifications. Century Electric Co.

174 **Control Batteries**—Twelve-pp Bulletin CP-539 describes batteries for control, switchgear and auxiliary power. Construction details are illustrated and described, and specifications are given as well as discharge characteristics curves. C & D Batteries, Inc.

175 **Improved Battery Plate**—Bulletin GB-1876 features information on silconic battery plate available on company's motive power batteries. Describes a process for introducing arsenic and silver cobalt sulphates into the active materials of positive plates which produces storage batteries having longer life, improved electrical characteristics. Gould-National Batteries, Inc.

176 **Silicon Chargers**—A chart for determining proper size and model of silicon-rectifier charger to be used with stand-by batteries is incorporated as a part of Bulletin 6258. Tabulating information on basic rectifier models, the chart enables user to select chargers according to number of cells to be charged, output amperage, input voltage. Exide Industrial Div., The Electric Storage Battery Co.

177 **Portable Cord, Cable**—Featured in 20-pp Bulletin PC-58 are portable cords and cable for light, medium and heavy duty applications. Includes information on type of jacket, type of construction and type of conductor. Detailed selection tables included. Whitney Blake Co.

178 **Selenium Rectifiers**—Featured in this 10-pp catalog are selenium rectifiers for efficient, economical a-c to d-c rectification in a wide range of sizes. Presents complete descriptive data and specifications for cell sizes from 1 in. sq. to 12-by-16 in. and for stacks of practically any size. Also illustrates rectifier circuits and gives continuous d-c ratings. Syntron Co.

180 **Rectifiers for Industry**—Ratings, electrical characteristics and descriptive data on a line of silicon and selenium rectifiers and diodes are presented in 16-pp Short Form Catalog. Specification tables are included, also photos and dimensional diagrams. International Rectifier Corp.

181 **On Millivoltmeters**—Operating principles, specifications, features, and ordering information on non-control and control millivoltmeters are presented in 28-pp Catalog C 10-1. Includes information on all control models such as Pyr-O-Vane, pulse Pyr-O-Vane, Protect-O-Vane, and the Pyr-O-Volt controller. Text is illustrated with photos, drawings and diagrams showing design details. Minneapolis-Honeywell Regulator Co.

INSULATION

182 **Pipe, Equipment Insulation**—Featured in 8-pp Publication IN-759 is a rigid hydrous calcium silicate pipe and equipment insulation effective for temperatures up to 1800 F. Physical properties are detailed, and specifications, applications covered. Owens-Corning Fiberglas Corp.

183 **Foamed Plastic Insulation**—Advantages of foamed plastic tubing insulation for warm or cold fluid line piping are detailed in this illustrated bulletin. Physical properties of the material given. Mundet Cork Corp.

184 **Insulating Cement**—This bulletin gives information on Cominco insulating cement for high temperature insulation of boilers, ovens, ducts, headers, turbines, valves, piping, heat exchangers, storage tanks. Provides data on various grades, thicknesses and thermal conductivity. United States Mineral Wool Co.

VALVES, PIPING, FITTINGS

185 **Cast Steel Valves**—Twenty-pp Catalog KS1-M covers company's cast steel valves, including gate valves, globe valves, angle valves, and swing check valves for refinery and industrial applications. Describes construction features. Kerotest Mfg. Co.

186 **Monel, Nickel Valves**—Bulletin 9 broadly defines applications of cast Monel and nickle valves to corrosive environment and describes their respective areas of usefulness. Gives chemical and mechanical properties and illustrates several basic designs. Alloy Steel Products Co., Inc.

187 **Air Control Valves**—An informative discussion of air valves and their selection together with condensed catalog listings is featured in the 12-pp Valve Finder. Provides an explanation of valve terms and principles. Includes three-step outline covering valve types, means of actuating and operating principles to simplify choice of valve. Hannifin Co.

188 **Non-Return Valve**—Eight-pp Bulletin S-2-B describes a single acting, non-return valve designed to close automatically when boiler pressure decreases below header pressure. Dimensional data and diagrams are included. Golden-Anderson Valve Specialty Co.

189 **Solenoid Control Valve**—Bulletin 582-A describes a pilot operated, single and double solenoid control valve said to combine rugged construction, compact design, zero leakage and full ½ in. flow (257 cfm at 100 psig). Lists sizes and dimensions and includes cross section showing components. Hunt Valve Co.

190 **Ductile Iron Products**—This 36-pp illustrated catalog describes a complete line of ductile iron products, including pipe, tubing, casing, fittings and special castings. Catalog gives technical information including grades, specifications, dimensions and uses. American Cast Iron Pipe Co.

191 **Plastics in Piping**—Handbook C-159, 16-pp, describes technology of plastic piping systems, installation and coupling methods, standards for plastic pipe. Provides temperature and working pressure chart for valves, and a table of service recommendations showing effects of 280 chemicals on five plastics used in manufacturer's valves. Gives data on valves, fittings. Chemtrol.

192 **Swivel Joints**—Described in Bulletin DP 100 are swivel joints for steam and hot gas service. Specifications and properties are listed, and dimensional data table and diagrams are included. Chiksan Co.

193 **High Pressure Fittings**—Featured in this 18-pp bulletin are O-Seal fittings for use in any type of high-pressure piping system, containing water, oil or gas. Descriptive and engineering details on globe valves, check valves, nuts, tail pieces, given. Combination Pump Valve Co.

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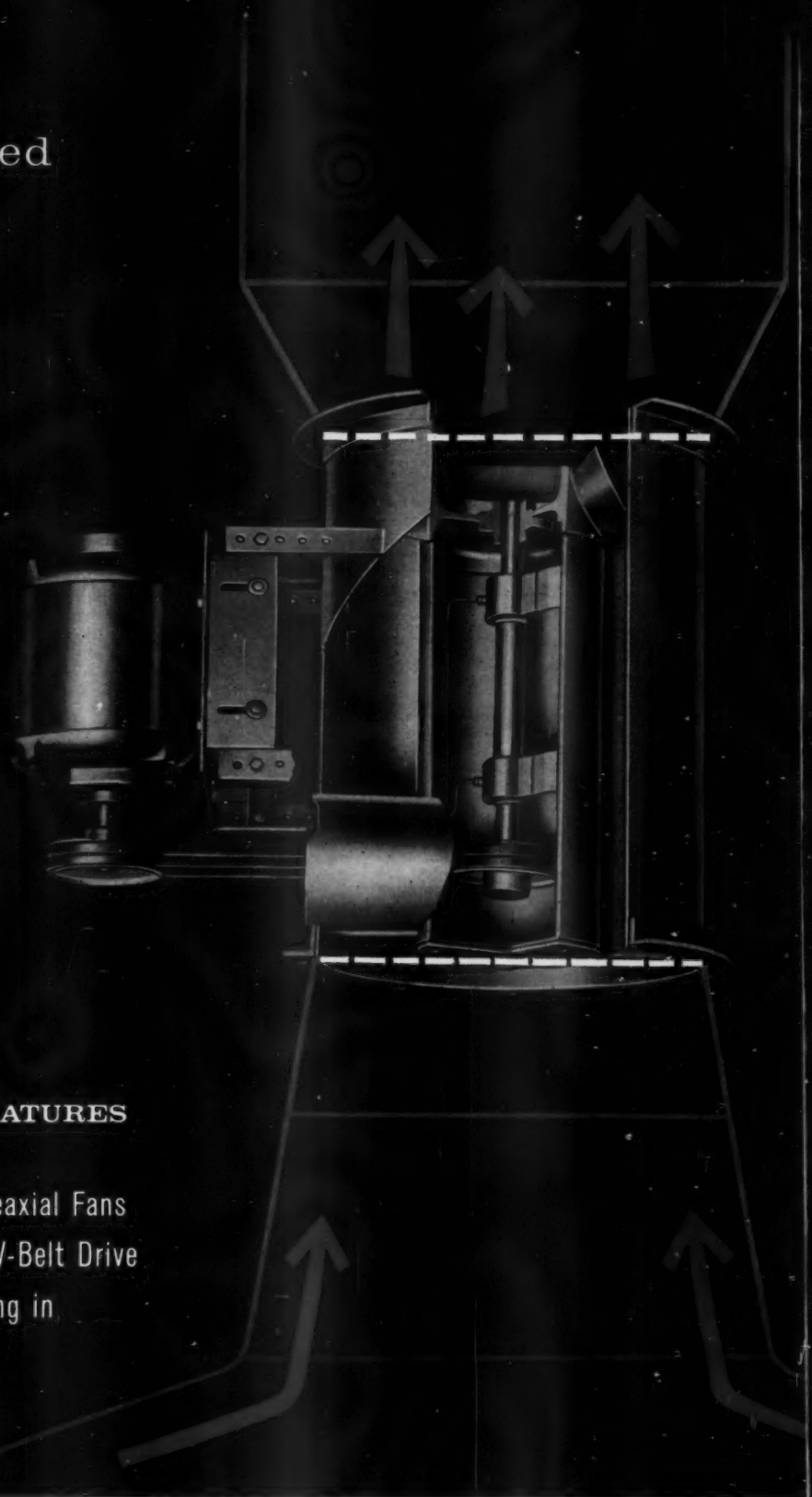

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MACHINE SHOP EQUIPMENT

194 Safe Grinding—Ten "do's" and "dont's" of grinding wheel safety are listed on this wall chart. Text is terse—easy to read, easy to remember. The chart is designed for hanging in tool rooms, tool cribs, near grinding machines. The Carborundum Co.

195 Grinding wheels—Twelve-pp Bulletin 7525 features a range of grinding wheel sizes, shapes with prices for every industrial application. Covers vitrified, resinoid and rubber bonds in cut-off, straight, recessed and plate-mounted wheels. Recommended applications are also given. Chicago Wheel & Mfg. Co.

196 Soldering Aluminum—Detailed information on soldering aluminum is presented in this reference bulletin. Includes data on soldering fluxes, irons and flames, and gives information on soldering methods, such as hot plate, dip, furnace, friction, glass fiber brush and ultrasonic operations. Reynolds Metals Co.

DATA FILE of literature for the plant engineer's library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided on pages 249 and 250.

MATERIALS HANDLING

301 For Overhead Handling—Booklet 2008-N 12 pp, is repleted with illustrative material on principal component of overhead handling systems. Track design and advantages of supporting it flexibly are described, and formulas and figures for comparing various track systems given. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

302 Vertical Transportation—Selection of vertical transportation for every traffic-moving job is detailed in 32-pp Bulletin A-382. Various types of elevators and escalators for a variety of commercial and industrial applications are described and illustrated. Otis Elevator Co.

303 Electric Hoists—Twelve-pp Bulletin DH 133D describes Speedway electric hoists of 500- to 4000-lb capacities. Fully illustrates and explains design features and gives details on suspensions and conducting systems. Clearance data included. Wright Hoist Div., American Chain & Cable Co., Inc.

304 Automatic Bulk Handling—Bulletin 530, 32 pp on Air stream conveyors presents information showing how pneumatic conveying has solved many bulk handling problems. System diagrams of typical installations point out applications and flexibility of conveyors. Over 70 illustrations show how air transports material. Dracco Div., Fuller Co.

305 Continuous Power Conveyor—Featured in 64-pp Catalog A-93-R is a continuous power conveyor designed to meet the requirements for handling continuous production items. Component parts of the system, including track, chain, and suspension components, are fully illustrated and described. Installations in a variety of industries are illustrated. Richards-Wilcox Mfg. Co.

306 Vibrating Feeders, Conveyors—Catalog 930 is a 96-pp book which extensively outlines company's line of electrical vibrating equipment. Covers hourly capacities, electric controls, dryers and coolers, bin level indicators and barrel packers. Principles of operation and detailed specifications are amplified by numerous photos. The Jeffery Mfg. Co.

307 Conveyor Belt Carrier—Bulletin 355, 20-pp, features comprehensive technical data, specifications and illustrations on conveyor belt carriers for conveying bulk materials. Dimensional data and diagrams are included. Stephens-Adamson Mfg. Co.

309 Steel Conveyor Belts—"A profitable approach to the selection of the subject of this 16-pp bulletin. Simplified selection, standard specifications, and installation information. The Colorado Fuel and Iron Corp.

310 Materials Handling Hose—Presented in Bulletin S-5121 is a line of materials handling hose for industrial applications. These include use in sand blasting, for steel shot blasting, for industrial vacuum cleaners, and for blowing insulation into walls. The Goodyear Tire & Rubber Co.

311 Sheet and Coil-Lifters—Bulletin SL-30, 16 pp, illustrates and describes various types of standard and semi-special lifters for one-man or automatic handling of sheet and coil stock. Advantages and design features are detailed and tables listing dimensions included. Cullen-Friestedt Co.

312 Boxes and Trays—Contained in this folder are separate data sheets on company's line of boxes and trays for moving, storing and drying. Advantages of construction and design are illustrated, and dimensional data given. Molded Fiber Glass Tray Co.

313 Material Handling System—How production, storage and material movement can be simplified, speeded-up and integrated with the use of Work-O-Matic units is detailed in 10-pp Catalog 89. Photos illustrate use. The Union Metal Mfg. Co.

314 Casters and Wheels—Twenty-pp Condensed Catalog 157-G covers many styles of casters, wheels and glides. Listing cover products for industrial, institutional, office and other applications. Installation guides, selection tables, descriptions and specifications are included. The Faultless Caster Corp.

315 Self-Dumping Hopper—Described in Bulletin 260 is a self-dumping hopper for low-cost handling of wet or dry, hot or cold, bulk materials. A variety of standard models are pictured and described in detail. Roura Iron Inc.

SLINGS, CHAINS, FITTINGS

316 Sling Chain Handbook—Illustrated Data Book 100, 32 pp, presents "how to do it" information on sling chains—from ordering to care, use and inspection. Contains diagrams, charts and tables on standard and special styles of the sling chains. Columbus McKinnon Chain Corp.

317 Slings For Industry—Bulletins 5886 and 5308-R describe Safe-Guard cable-laid slings, designed for applications where a soft sling body is required and where flexibility is more important than resistance to abrasion; and rope-laid slings for applications where abrasion resistance is a must. Macwhyte Wire Rope Co.

318 Self-Lubricating Chain—Bulletin SLC-57 describes and illustrates exclusive, oil impregnated sintered bushing design feature of company's self-lubricating roller chain. Engineering data, dimensions and application reports. Whitney Chain Co.

319 Drop Forged Fittings—Comprehensive data on company's line of drop forged fittings for wire rope and chain are presented in 40-pp Catalog 950-2. Includes specifications, dimensions, rated capacities and weights. Crosby-Laughlin Div., American Hoist and Derrick Co.

MAINTENANCE

321 Metal Treatment—Booklet 15 describes a metal treatment that stops rust action and prepares rusted metal for paint. Advantages are detailed and application method illustrated. Rusticide Products Co.

322 Zinc Coating—Described in this bulletin are properties and advantages of Dimetcote 3, an inorganic zinc coating which "cold galvanizes" any steel surface. Typical applications are illustrated and general properties listed. Amercoat Corp.

323 Handbook on Coatings—This 1958 Coating Manual is a 32-pp treatise highlighting the stopping and preventing of rust on nearly all types of rustable metal. Book contains information and recommendations to enable determination of specific coatings needed. Basic principle of Rust-Oleum's fish oil penetration into metal is shown. Rust-Oleum Corp.

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DATA FILE

(Begins on page 254)

324 Aluminum Coating—An aluminum coating designed to protect against rust and corrision which can be applied by brushing, spraying and dipping is described in this product bulletin. Typical applications are illustrated. Gulf Oil Corp.

325 Guide to Maintenance Products—Catalog 56, 48 pp, on industrial maintenance paint products lists specialized coatings to resist alkalies, acids, oils, grease, moisture. Book also covers waterproofing, roof coatings, caulking compounds, floor patching materials. Gives technical information on paints for special applications. Steelcote Mfg. Co.

326 Industrial Vacuum Cleaning—Twelve-pp Bulletin 155 B describes both stationary vacuum cleaning equipment and portable industrial vacuum cleaners, the latter in both light and heavy-duty types. Recent improvements in collection and dumping methods are also covered. Spencer Turbine Co.

327 Vacuum Units—This bulletin describes heavy-duty, portable vacuum units designed for a variety of plant housekeeping jobs. Application in removing litter, conveying or reclaiming materials, and collecting hazardous matter is covered. Invincible Vacuum Cleaner Mfg. Co.

TOOLS, MACHINE SHOP

328 Where to Use Your Stud Driver Twenty-pp pocket-size Form 955 describes and pictures applications of studs, using company's Model 450 stud driver. Provides some operating hints and safety precautions and covers use of studs through steel into concrete, wood into concrete, wool into steel and steel into steel, as well as their use in attaching pre-drilled fixtures. Remington Arms Co., Inc.

329 Hydraulic Jacks, Pullers—Bulletin Hydraulic-56, 16 pp, features company's line of hydraulic jacks and pullers. Prepared as an application guide for using various high-pressure jacking and pulling tools, it contains full descriptions, mechanical specifications. Templeton, Kenly & Co.

330 Industrial Wrenches, Hand Tools—Tools for production lines, maintenance work and product servicing are featured in a 156-pp Industrial Catalog 58-I. Loaded with pictures and tool facts, book describes in detail the complete line of over 4,000 tools—including chests and rollcabs, wrenches and sockets of all types, screwdrivers, pliers, pullers, etc. Snap-on Tools Corp.

331 Pipe Tools—Ordering and application information on Ridgid pipe tools is provided in 16-pp illustrated Catalog 7596R6. Wrenches, cutters, threaders, reamers, vises, and others are pictured and described, also power drives. The Ridge Tool Co.

332 Electric Tools—Catalog G-6 (1), 66 pp, describes electric tools for a variety of industrial applications, including drills, grinders, hammers, nut runners, polishers, right angle drives, sanders, saws, screw drivers and others. Application photos show features, prices included. Milwaukee Electric Tool Corp.

333 Portable Electric Tools—Form 10 features a complete line of portable electric tools including drills, screw-drivers, impact wrenches, magnetic drill presses, sanders, grinders, hammers, holesaws, and forged tools. The Black & Decker Mfg. Co.

334 Power Tools—Industrial construction and other portable power tools for the manufacturing, construction, woodworking and metal-working industries are described in this 50-pp catalog. Tools appear in logical sequence of size and duty rating. Skil Corp.

335 Powder Actuated System—Two booklets cover applications of a powder actuated fastening system. One booklet shows how it can be used for plant maintenance — fastening conduits, bus ducts, junction and outlet boxes, surface raceways, fixtures and frames, etc. The second booklet indicates the correct fastening and charge to use to fasten materials to concrete or steel. Ramset Div., Olin Mathieson Chemical Corp.

336 Data for the Shop—"Fluids and Facts for Metal Working" is a pocket-size booklet of about 44 pp. A section on metal working fluids covers their function and selection, preparation and use of soluble oils and paste compounds, and prevention of dermatitis. Conversion tables, steel numbering systems, machinability ratings. Standard Oil Co. (Ind.)

LUBRICATION

337 Plug Valve Lubricants—Reference Book 39—Section 5A, 16 pp, describes company's plug valve lubricants and lubrication accessories. Standard lubricant table gives detailed description and extreme temperature range of each lubricant. Homestead Valve Mfg. Co.

338 Lithium Greases—This product information bulletin presents manufacturer's six Litholine industrial greases, stressing industry advantages offered by these multi-purpose greases. Gives properties of greases, application and performance characteristics. Sinclair Refining Co.

339 Organized Lubrication—Benefits of organized lubrication are extolled in this 24-pp bulletin. Cost control opportunities are detailed and the task of assigning responsibilities and delegating authority in an organized lubrication system discussed. Method of determining savings and setting up records to measure results covered. The Texas Co.

340 Lubricant Data—Characteristics, advantages of company's line of specialized fluid and grease type lubricants are described in 32-pp Data Book 59-1. Includes sections on control of friction, use of grease type lubricants, proper applications, and recommendations for various operating conditions. Lubriplate Div., Fiske Brothers Refining Co.

341 Product Guide—This handy little booklet gives information on manufacturer's line of industrial products—general lubricants, greases, diesel lubricating oils, metalworking oils, hydraulic oils, heat-transfer oils, waxes, petro-chemicals, spray oils, solvents, others. Sun Oil Co.

MECHANICAL POWER TRANSMISSION

342 Power Transmission Machinery—Featured in this 8-pp bulletin are products in company's power transmission equipment line, including a dry fluid drive, flexible cushion coupling, sheaves, sprockets, roller chains, speed reducers, screw conveyor drive, pillow blocks, bearing units, sleeve bearings and other items. Dodge Mfg. Corp.

343 Chains, Sprockets—Catalog 757, 68 pp, on company's stock roller chains and sprockets, stresses advantages gained through roller chain use, and pictures some typical roller chain drives. Tells how to select stock roller chain drives. Provides specifications, ratings and prices. Diamond Chain Co., Inc.

345 On Drive Selections—Steps in selecting a heavy duty V-belt drive are outlined in 16-pp Bulletin DH-301. Service factor table, design horsepower table, minimum installation allowance table and complete selection tables are included. The Gates Rubber Co.

346 Flange Mounted Drives—Bulletin 7140 contains selection data for flange mounted drives for a variety of applications. A load classification table is included, as well as tables of minimum sheave pitch diameters, load location factors, overhung load capacities. The Falk Corp.

347 Fluid Power Circuit—The 28-pp revised edition of the "Circuit Rider" describes representative types of fluid power circuits and the possibilities afforded by their use. Circuits cover sequencing, semi-automatic and automatic cycling, dual pressure systems, safety systems, skip feed arrangements ,and synchronization. Logansport Machine Co., Inc.

348 Anti-Friction Bearings—Catalog 424-B, entitled "The broadest line in the anti-friction field," an 8-pp folder giving capsule presentation of company's entire product line. A brief description of each product is provided. SKF Industries, Inc.

349 Ball Bearing Trolley—Book 2536, 20 pp, describes a ball bearing trolley engineered for overhead con-

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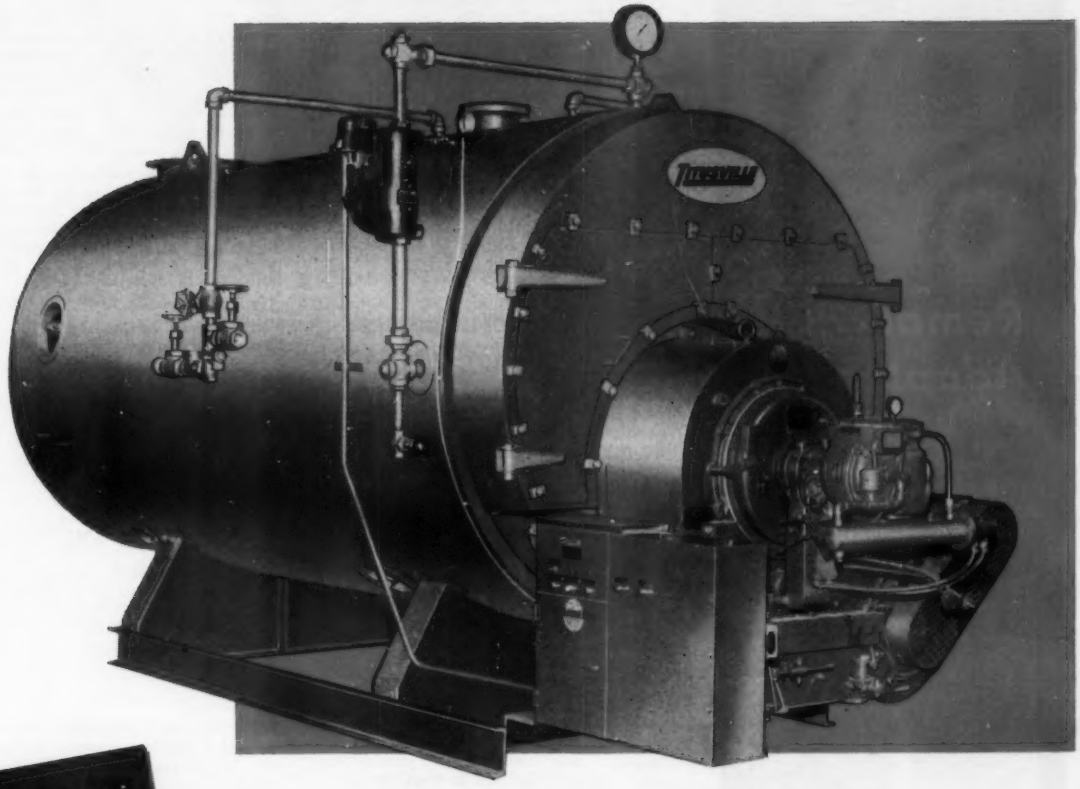

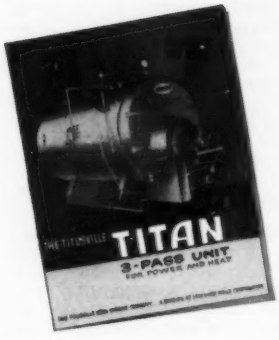

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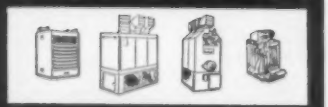

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DATA FILE

(Begins on page 254)

veyors. Features are shown on a large cutaway view and selection tables are included, as well as photos, dimensional diagrams. Link-Belt Co.

350 Flexible Couplings—Condensed Engineering Catalog 51-A contains excellent data on the choice and use of company's flexible metal couplings for power transmission. Tells advantages of these couplings. Thomas Flexible Coupling Co.

351 Coupling Data—An integrated selection of product bulletins and data on company's line of couplings for a variety of industrial applications is presented in this handy ring-bound notebook. The notebook contains sections on product literature, engineering data, instruction sheets, application data, and price lists. To all of these sections, additional material can be added as it becomes available. Koppers Co., Inc.

PUMPS, COMPRESSORS

353 Vertical Pumps—Bulletin 726.2, 12 pp, describes company's line of heavy duty vertical centrifugal sump and process pumps. Includes specifications, sectional views, performance ratings, and a chart of construction materials for interchangeability. Goulds Pumps, Inc.

354 Multi-Stage Pumps—Featured in 18-pp Bulletin Form 7251 are multi-stage centrifugal pumps for the medium pressure field. Simplified design is illustrated with a large cutaway view showing component features. A table of parts interchangeability is included, along with other engineering data. Ingersoll-Rand.

355 Non-Clog Pumps—Bulletin P10-B41 describes a line of non-clog pumps for industrial processing, waste handling and sewage applications. Diagrams illustrating general arrangement are included, as well as tables of dimensional data, selection charts. Western Machinery Co.

356 Centrifugal Pump—Bulletin 5005 contains 22-pp of detailed information on alloy metal centrifugal pumps for hot or cold corrosive and slurry service. Specifications, dimensional data and cross sectional diagrams give essential facts on materials of construction, design and construction features. Dorr-Oliver Inc.

357 Single Suction Pumps—Ball bearing single suction pumps are illustrated and described in 24-pp Bulletin 976-G. General data and specifications are included, as well as rating tables, outline dimensions, sectional reference drawings. Buffalo Pumps, Div. Buffalo Forge Co.

358 Rotary Blowers, Pumps—Full details on continuous-service rotary positive pressure blowers, gas and vacuum pumps are included in 20-pp Bulletin S65C. Contains photos and cut-away drawings, showing construction features, as well as explanation of operating principles and a list of applications. Sutorbilt Corp.

359 Horizontal Compressors—Eight-pp Bulletin HAC-40 describes company's Class RX horizontal, single-stage air compressors. Keyed cutaway illustrations show design and construction features. Lubrication, controls available and standard equipment are covered. Gardner-Denver Co.

360 Air Compressors—Featured in this product bulletin are air compressors designed for a variety of industrial applications, including tank or base mounted units, simple compressors, single and two-stage, air cooled, electric or gasoline driven, ¼ to 50 hp. Curtis Mfg. Co.

361 Oil-Free Compressors—Heavy-duty industrial oil-free compressors are featured in 12-pp Bulletin A-44. Component parts are illustrated and described, and internal construction is shown on cutaway. Joy Mfg. Co.

362 Compressors, Gas Turbines—Featured in 38-pp Bulletin 151 is a line of compressors and gas turbines for the petroleum, gas, production, pipeline, refining, chemical, petrochemical industries. A number of different models in the line are covered, with descriptions of features and operation, and dimensional data and diagrams. Clark Bros. Co.

PACKINGS AND SEALS

363 Mechanical Seals—Precision mechanical seals for almost every rotating shaft sealing problem are described in this bulletin. Design features are illustrated with cutaway views and advantages given. Borg-Warner Corp.

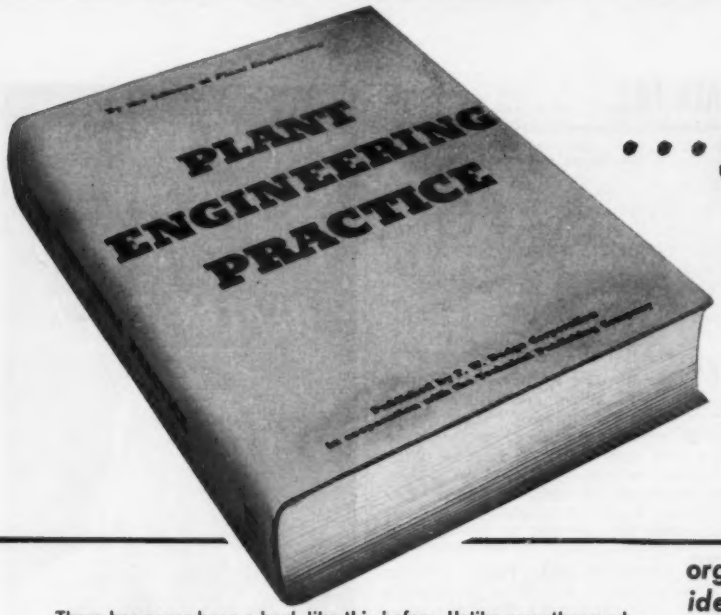
364 Piston Packing—Sixteen-pp Bulletin 5503 presents engineering data on Darcova Pumcups for packing pistons of air cylinders, hydraulic cylinders and reciprocating pumps. Included are operating diagrams and a list of typical installations, as well as helpful data on Pumcup compositions. Darling Valve & Mfg. Co.

DUST, FUME CONTROL

365 Industrial Dust Control—Bulletin 104, 36 pp, on company's dust filters, gives detailed information about dust control systems and how to engineer them. Includes description of the Roll-Clean Dynaclone dust filter, as well as information, capacities and dimensions for other dust filters. The W. W. Sly Mfg. Co.

366 Industrial Dust Control—A wide variety of collection methods for industrial dust control is described in 16-pp Bulletin 922. A typical case history is included as well as photos, cutaway views, drawings and capacity data. Pangborn Corp.

367 For Dust Collection—A collection of product sheets providing ap-



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ball and roller bearings, fluid power (including installation, selection of fluids, pumps, valves, accumulators and intensifiers), belt drives, compressed air systems, steam systems.

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dry and oil type transformers, electric motors, other electrical equipment, also installation and selection of ground systems, capacitors, and electric safety precautions and procedures.

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emergency installations, mercury, fluorescent, and incandescent systems, maintenance and installation of high ceiling fixtures, including use of overhead cars.

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power cable placement, intercoms, water softening, cafeteria design and maintenance, control of drinking water purity, recovery of industrial wastes, handling radioactive byproducts.

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control against dust, heat, steam, odor, insects, radiation; installation and maintenance of fuel tanks, condensers, hot-water systems, oil burners and cooling systems.

12. QUALITY CONTROL
instrumentation, functions of instruments, dial gauges, use of isotopes and x-ray for quality control.

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(Begins on page 256)

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FANS, BLOWERS

369 Air-Moving Equipment—Bulletin DB 45-58, 20 pp, contains detailed information on company's line of roof ventilators, bifurcators, axial flow vent sets, and air jets. Bonded performance ratings are listed on tables, and dimensional data included. De-Bothezat Fans Div., American Machine and Metals, Inc.

370 Standard Duty Fans—Designs and construction details of company's line of standard duty fans are covered in 28-pp Bulletin 543. Points out advantages, shows arrangement and application, describes accessories. The New York Blower Co.

371 Induced Draft Fans—Catalog L-3 describes induced draft fans designed for any induced draft application for temperatures up to 800 F. Gives dimensions, capacities, as well as installation data. Fuller Co.

372 Industrial Fans—Bulletin 690-A, 12 pp, contains dimensions and application and performance data on direct connected fans for general and system ventilation and power roof ventilators, with air deliveries to 103,200 cfm. Design features and typical installations illustrated. Propellair Div., Robbins & Myers, Inc.

373 Ready Units—Catalog 515 provides 28-pp on complete, ready-to-run centrifugal fan equipment. Capacities 400 to 13,000 cfm, v-belt and direct drive units. Dimensions and capacities included. Clarage Fan Co.

374 Air Diffusers — Bulletin 30F present information on company's air diffusers, high velocity valve attenuators, and air recovery equipment. Units are described and illustrated as to design requirements, dimensions. Connor Engineering Corp.

375 Power Exhausters — Bulletin 58-B contains 12 pp of detailed information on company's line of power exhausters. Construction features are illustrated and described, and performance and dimensional tables are included. Cutaway views and drawings show internal construction features. Jenn-Air Products Co., Inc.

INSULATION

376 Insulation Specifications—This set of six specifications covers applications of Foamglas insulation for industrial equipment and piping. Each booklet contains tables of suggested thicknesses of insulation to be applied, drawings of installation procedure, supports, and recommended

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finishes. Booklets are devoted to low-, medium-, high-, and dual-temperature equipment and piping, to underground piping, and spheres. Pittsburgh Corning Corp.

377 Pipe Insulation — This 40-pp catalog was designed as a reference guide to company's pipe insulation, presenting a new way to specify proper thickness for pipe insulation, based in the "J" factor. Book also shows how single-layer insulation is applied. Union Asbestos & Rubber Co.

378 Insulation Coating—This 32-pp illustrated handbook, Form L-17, presents the advantages of company's No-Drip insulation coating for preventing condensation drip from metal, concrete, brick, wood, plaster, or composition surfaces. Lists applications. J. W. Mortell Co.

CONSTRUCTION

379 Functional Glass—Advantages of company's rolled, figured and wired glass for vertical sidewall and skylight glazing are detailed in Catalog 59-G, 20 pp. Describes types suited for commercial, institutional, industrial applications. Provides properties. Mississippi Glass Co.

380 Fiber Glass Panel—Technical data and installation procedures for fiber glass reinforced plastic glazing panes are presented in this illustrated brochure. Outlines product's mechanical and physical properties and heat transmission. Filon Plastics Corp.

381 Replacement Glazing—Twelve-pp Booklet PL-251 gives detailed information on glazing industrial and other buildings with flat panels of the acrylic plastic, Plexiglas. Written for plant engineers concerned with frequent breakage of windows or other glazing problems, this practical booklet gives properties of this sheet. Plastic Dept., Rohm & Haas Co.

382 Unit Wall Construciton—Twelve-pp Technical Bulletin UW-100-5 describes and illustrates application of company's Uniwall for complete single unit, moderate cost, wall construction in buildings of all types. The bulletin contains construction details. Natco Corp.

383 Fir Plywood—This 34-pp construction guide contains full-page structural drawings providing basic information on types, grades, and applications of fir plywood. Booklet covers information on floor construction. Douglas Fir Plywood Ass'n.

384 Wood Products—A variety of wood products and finishing materials for every type of construction are listed in this product bulletin. Reference guide lists grades, sizes and other data on lumber, plywood and hardboard. Georgia-Pacific Corp.

386 Aluminum in Colors—This bulletin introduces Alcoa's Alumalure colored aluminum architectural building sheet products, a complete line of sheet products offered in 11 colors. Aluminum Co. of America.

387 Protected Roofing, Siding—Advantages of Color Galbestos roofing and siding are outlined in 12-pp Bulletin R-28-59a, illustrated in color. Shows how this metal roofing and siding is made, illustrates colors and corrugations available. Includes installation photos, diagrams, specifications and drawings of structural details. H. H. Robertson Co.

388 Grating and Treads—Bulletin 2566 is a revised illustrated bulletin on grating and treads for a variety of applications. Presents descriptions of electro-forged, rivited, rectangular, diagonal, U-type and T interlocked grating and treads. Tables of safe loads and information on specifying are also included, as well as photos of applications. Blaw-Knox Co.

389 Steel Floor Plate — Skid resistance and other advantages of USS multigrip rolled steel floor plate are stressed in this illustrated bulletin. Also gives dimensions, data on loads. United States Steel Corp.

390 Non-Slip Flooring—Algrip, an abrasive rolled steel floor plate described as non-slip even on steel inclines, is the subject of Booklet AL-29, 8 pp. Discusses safety features, fabricating. Alan Wood Steel Co.

391 Flooring Materials — Bulletin 658 describes a complete line of heavy-duty flooring materials designed to solve tough flooring problems. Text explains the use and application of heavy duty emery ag-

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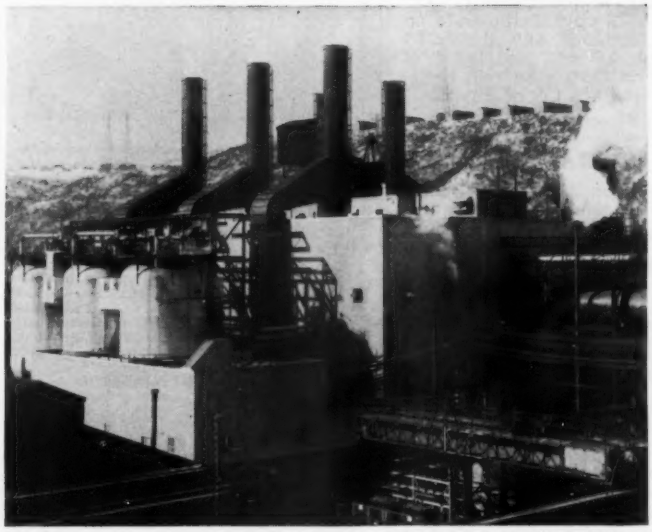

THE PLANT: Large power station serves U.S. Steel's National Tube Division at McKeesport, Pa. Monongahela River water is used for boiler make up.

River water is clarified with Hagan Coagulant Aid and alum, softened with lime and soda ash and deaerated for use in boilers. Desuperheating condensate system was forecast as corrosion weak spot because of high CO_2 in steam. To evaluate cost of maintenance versus treatment, National Tube engineers adopted a "wait and see" policy.

THE PROBLEM: Magnitude of corrosion was almost unbelievable. Standard 1" x 2" x 20 gauge carbon steel test strips pitted through within 24 hours. Low pressure heater shells had to be continually patched. Spill-over lines and fittings failed almost weekly. Maintenance costs rocketed to a high of $10,000 a year.

THE SOLUTION: Treatment with Hagafilm reduced corrosion rate from a no treatment level of 1285 to less than 1 mg/dm²/day with a 4 ppm feed; and to a range of 5 to 10 mg/dm²/day with a 2 ppm feed. Present practice is to feed at a rate of 3 ppm.

RESULTS: Since introduction of Hagafilm four years ago, no failures have occurred in spill-over system lines and fittings. Corrosion in entire desuperheating condensate system has been arrested.

National Tube engineers say that Hagafilm treatment has already paid for itself many times over in reduced labor and maintenance costs.

FOR FULL INFORMATION on Hagafilm, write for free Bulletin 410-12-7.

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DATA FILE

(Begins on page 254)

gregates, bricks, bonds and cures and includes engineering data on each of these. Walter Maguire Co., Inc.

392 Flooring Products—Illustrated in color, this 12-pp catalog displays the full line of this company's flooring products. Provides product descriptions, tells where to install and includes brief specifications on Azrock vinylized tile, Azphlex vinylized tile, Vina-Lux vinyl asbestos tile, and others. Azrock Floor Products Div., Uvalde Rock Asphalt Co.

393 Grating, Stair Treads—Bulletin 1105, 16 pp, describes construction and design advantages of company's line of interlocked grating and stair treads. Contains detailed information, photos, drawings and engineering data on rectangular, diagonal, radial and serrated gratings, stair treads, armoring. Dravo Corp.

394 Steel Grating—Featured in 16-pp Bulletin 14R are company's steel grating and stair treads for a variety of industrial applications. Pictures of typical installations are included, also tables of engineering data. Kerrigan Iron Works, Inc.

395 Foundation Pipe Piles—Comprehensive information on Taylor Forge spiral-weld foundation pipe piles is presented in 24-pp Form F-5677. In addition to detailed specifications, the illustrated booklet describes a number of pipe-pile installations and includes driving logs. L. B. Foster Co.

396 Open Web Joists—Standard and long span open web steel joists are illustrated and described in this 38-pp catalog. Advantages of the steel joist construction are detailed, and sections are included on design calculation, properties and dimensions. United States Steel Corp.

397 Aluminum Fencing—Chain link fencing made of aluminum is featured in this 12-pp bulletin. Data on corrosion resistance and durability is furnished, as well as photos of typical applications. Suggested specifications. Aluminum Co. of America.

METALS

399 Aluminum and Steel Data—Comprehensive selection data on aluminum and steel available in stock for almost every application is presented in this 242-pp buying guide. Necessary weights, dimensions and descriptive data are tabulated. Individual sections cover structural shapes, construction products, plates, sheets, hot rolled bars, cold finished bars, alloy and tool steel, tubing, stainless steel, aluminum, others. Joseph T. Ryerson & Son Inc.

400 Molybdenum in Steel Castings—This 36-pp brochure on the role of molybdenum in steel castings for industrial equipment discusses hardenability, tensile properties, fatigue, hardness, wear and impact resistance, machinability, and weldability of cast steels. Climax Molybdenum Co.

BOILERS AND GENERATORS

401 Self-Contained Boilers—Bulletin AD-162, 8 pp, describes company's complete line of self-contained boilers for heating and processing steam or hot water. Design features and advantages are also covered. Cleaver-Brooks Co.

402 Bent Tube Boilers — Bulletin VF-VS2, 22 pp, describes a line of bent tube boilers designed to serve a wide variety of industries with diverse steam generating requirements. Principal data and schematic diagrams of typical installations included. Henry Vogt Machine Co.

403 Hot Water Boilers — Catalog HCC-2, 20 pp, describes and illustrates design, construction, advantages and economics of company's controlled circulation hot water boiler for supplying high pressure, high temperature water for heating systems and process applications. Combustion Engineering, Inc.

404 Steam Generator—Bulletin 582 CS describes design and operation features of company's vapor water tube steam generator which differs from conventional water tubes steam generators in the initial heating and final vaporization occur in the shell. TXT Texsteam Corp.

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HEATERS, HEATING

405 **Unit Heaters**—Catalog 158, 28 pp, contains performance and application data on company's line of unit heaters, including design and construction details, dimension diagrams, and tabulated information on steam capacities, conversion factors, performance factors. Modine Mfg. Co.

407 **Unit Heaters** — Gas-fired unit heaters designed for economical heating of industrial and other buildings with any type of gas are featured in 8-pp Catalog 58. Advantages of design and operation are fully covered, and selection and specification data furnished. Grinnell Co., Inc.

408 **Industrial Heaters** — Advantages and features of a line of industrial heaters for space heating, drying, make-up air and oven applications are detailed in this illustrated bulletin. A cutaway view points out features. Lennox Industries, Inc.

409 **Direct Fired Heaters** — Complete description and specifications on unit heaters, duct furnaces and heavy duty heaters are presented in 12-pp Bulletin A1-1.2b. Cutaway views and construction features are included. Reznor Mfg. Co.

410 **Electric Heat, 101 Ways**—Principal industrial heating applications and methods are described in "101 Ways to Apply Electric Heat," a 32-pp booklet. Illustrated case histories show how metal-sheathed electric heating units are being used. Physical aspects of installation are detailed. Edwin L. Weigand Co.

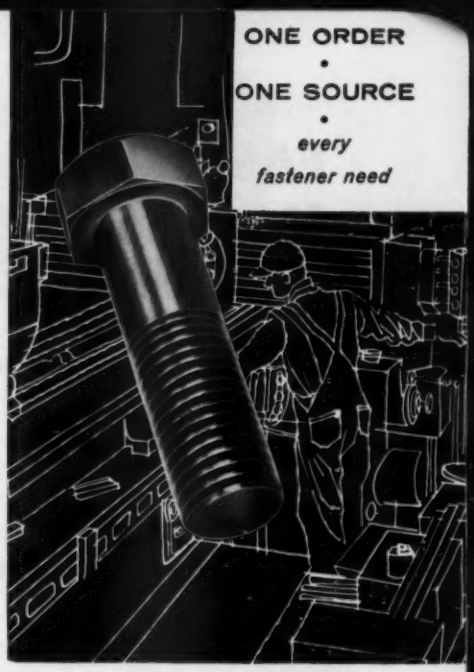
INSTRUMENTS, CONTROLS

411 **Gages, Needle Valves**—Catalog 76-G consists of a loose-leaf bound collection of literature on gages and needle valves. Various types of gages are illustrated and described, with applications and specifications fully detailed. Jas. P. Marsh Corp.

412 **Pressure Gages**—In 16-pp Catalog 305 are described gages, with and without integrated switches, used most widely in operation of power and steam plants, refrigeration systems, metal working industries, hydraulic presses, and others where steam, water and non-corrosive oils and gases are principal measured media. United States Gauge, Div., American Machine and Metals, Inc.

413 **Precision Instruments** — Catalog G1 contains 32 pp of comprehensive information on indicating, recording and controlling instruments. Contains descriptive and illustrative data on potentiometers, pyrometer supplies, systems and components, null indicators, amplifiers and oscillographs, pressure gages, flow and liquid level meters, others. Minneapolis-Honeywell Regulator Co.

414 **For Limited Panel Space** — Bulletin 532 describes Model 216 indicator used with company's automatic tank contents gage. Bulletin contains a full illustration of indicator which, although occupying a



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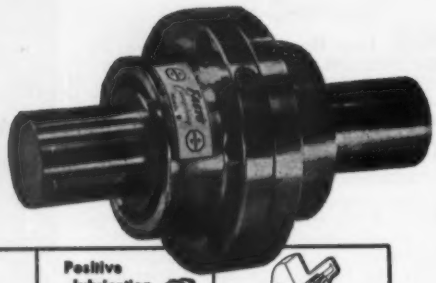

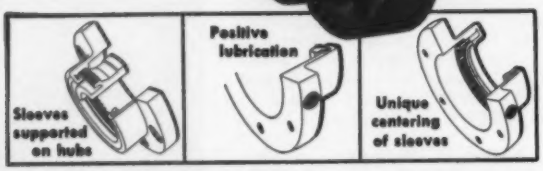

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DATA FILE

(Begins on page 254)

small space, has a scale 20 in. long. The Liquidometer Co.

415 Temperature Controls—Eight-pp Catalog CC, on temperature controls and allied equipment for heating and refrigeration, provides information on recording, indicating non-indicating controls; thermometers; bulb accessories. The Partlow Corp.

416 Graphic Instruments — Featured in 16-pp Catalog 657 is a line of graphic instruments designed to serve a variety of industrial measuring applications. Complete descriptive details on various types of recorders and accessories included, as well as ratings. The Esterline-Angus Co., Inc.

417 Stroboscope Data — Applications of the electronic stroboscope are illustrated and described in 8-pp Form 766-D. Includes complete descriptive and specification data on the Strobotac—a small, portable stroboscope tachometer—as well as on the Strobolux, the Strobolume and the Microflash. General Radio Co.

418 Strip Chart Recorder—Detailed information on a small, compact strip chart recorded is presented in this product data sheet. Specifications are included, as well as price and ordering data. Rust Industrial Co., Inc.

VALVES, TRAPS, PIPING

420 Valve Performance Facts—Included in this 36-pp booklet are 32 case histories of cost-saving valve installations. Service applications covered include steam, oil, water, coating fluid, chlorine, phenol, pulp stock, vacuum, others. Crane Co.

422 Pressure-Reducing Valve—Bulletin J-160 describes features and advantages of company's pressure reducing valves for dead end shut-off and positive pressure regulation. Operation details are shown on cutaway view, and recommended capacities given on tables. Jordan Corp., Div. of OPW Corp.

423 Solenoid Valves—Featured in this 8-pp bulletin are packless solenoid valves designed to permit more flow at any pressure up to maximum rated capacity. Specifications and performance charts are included, as well as flow patterns. C. A. Norgren Co.

424 Industrial Valves — Bulletin 507V illustrates and describes company's line of industrial valves for control of air, gas, liquids and solids. Features photos and descriptive detail on a variety of valves, including butterfly valves, water valves, slide valves. W. S. Rockwell Co.

425 For Bulk Materials — Bulletin N-578 describes rotary valves for continuous discharging or feeding of dry, free-flowing bulk materials. Pictures use as air locks under cyclones on suction, and on dust filter, and as

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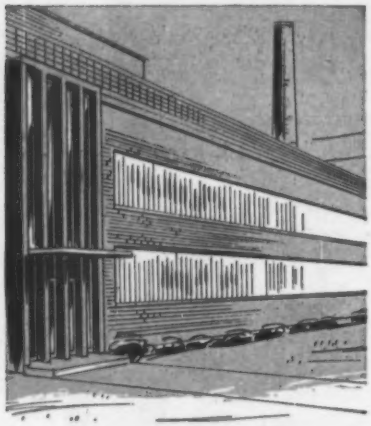

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DATA FILE

(Begins on page 254)

feeders into low velocity pneumatic conveying lines. The Day Co.

426 Plug Valves — Catalog PV-5 contains 38 pp of detailed information on company's lubricated plug valves designed for positive shut-off of fluids. Design and construction features are fully illustrated and described, and cutaway views of various models in the line are included. The Wm. Powell Co.

427 Stainless Steel Valves—Corrosion resistant stainless steel valves are featured in 32-pp Catalog 59SS. Features of design and construction are shown through cutaway views, and advantages of stainless steel in withstanding corrosive attack of chemicals and atmospheres are detailed. Jenkins Bros.

428 On Steam Traps—Catalog K is an enlarged 48-pp manual and steam trap catalog. New material provided includes open float and thermostatic traps, pipe strainer to 6 in. in steel and semi-steel, and helpful steam pipe sizing tables. Discusses fundamentals of good trapping, trap selection, installation, testing, repairs. Armstrong Machine Works.

429 Impulse Steam Traps—Bulletin T1744 describes a line of impulse steam traps designed for light condensate load requirements. Operation is detailed, and capacities, dimensions and weights tabulated. Yarnall-Waring Co.

430 Steam Traps — Bulletin 808 contains descriptive information on a line of combination float and thermostatic type steam traps. Cutawa views illustrate details of operation and design. Wright-Austin Co.

432 PVC Pipe, Fittings—This 12-pp bulletin contains latest technical information on polyvinyl chloride pipe and fittings, including advantages and properties, general characteristics and applications, physical properties, installation instructions, flow rate charts and specifications. Mueller Brass Co.

433 Expansion Joints — Features and advantages of company's line of expansion joints and flexible couplings are illustrated and described in 12-pp Form AD-137. Standard dimensions and other engineering data are included. The Garlock Packing Co.

434 Guide to Couplings—This 26-pp general catalog describes company's quick-connect, quick-disconnect couplings, including a coupling for high pressure applications, for impact in air lines, for low pressure applications, for vacuum and very low pressures, etc. Snap-Tite, Inc.

435 Bellows Design Guide—Twenty-pp Catalog 155 contains helpful information on applications, design

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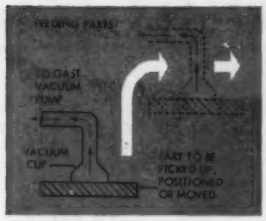

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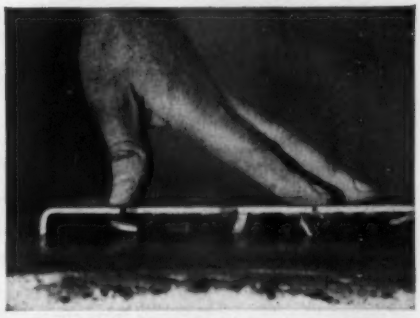
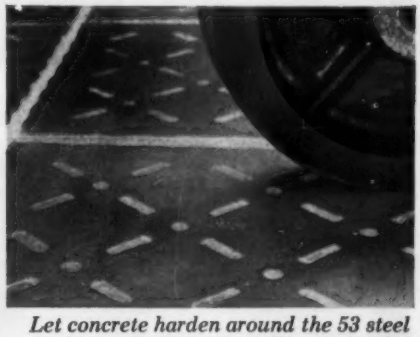


2

While it's wet, position Ancor Plates and gently tap them to proper level.



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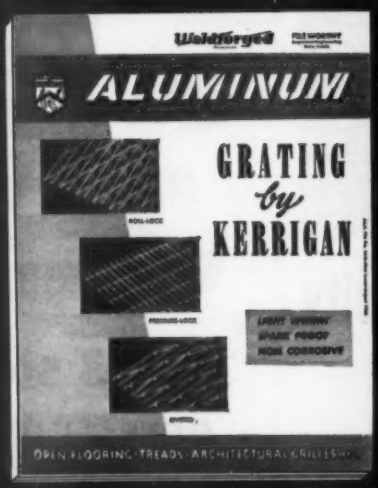

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Please send me your new aluminum grating catalog containing engineering data.

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DATA FILE

(Begins on page 254)

considerations, and standards for metallic bellows. Details on using bellows manufactured from various metals are included. Flexonic Corp.

436 **Self-Cleaning Strainer**—Bulletin 1210B describes self-cleaning, semi-steel pipeline strainers in sizes from ¼ through 3 in., featuring high strength construction of the bodies, long tapered screen socket, perforated heavy-gage screen. Includes dimensions, weights. Sarco Co., Inc.

FILTERS, FILTERING

438 **Filters, Strainers** — Industrial Catalog 1058, 48 pp, provides application and engineering information on company's line of micro-filters and precision strainers. Fuel filters, full flow and by-pass lube filers, dry type air filters, air separators, and metal edge strainers shown. Purolator Products, Inc.

439 **Activated Carbon** — Absorbency characteristics of activated carbon and its application in filtration, purification, refining and reclamation processes are discussed in this 10-pp bulletin. Typical uses of granular and pulverized activated carbon are illustrated. Activated Carbon Div., Pittsburgh Coke & Chemical Co.

ELECTRICAL

440 **Outdoor Motors**—Six-pp Bulletin 2550 describes horizontal weather-protected motors from 250 to 2000 hp, designed for outdoor use under extreme weather conditions. Cutaway drawings show construction. Standard and special features are described. The Louis Allis Co.

441 **Rerated Integral HP Motors**—Bulletin 520 describes polyphase open-protected motors in re-rated NEMA frames. Ratings through 200 hp. Motor Div., Robbins & Myers, Inc.

442 **Trolley Busway System**—Three bulletins offer help on electrical installations involving cranes and hoists, assembly and production lines, test lines and other moving electrical equipment. Bulletin 60, 40 pp, covers 60 amp systems; Bulletin 70, 32 pp, covers 225-500 amp systems; Bulletin 75, 44 p, covers 100 amp systems. Each includes special section on installation planning and procedure, mounting. Feedrail Corp.

444 **Butyl Insulation**—Characteristics and advantages of butyl rubber as an insulating material for high voltage power cables are detailed in this 28-pp bulletin. Chemical and electrical properties of butyl are charted, as well as such qualities as aging resistance, ozone and corona resistance, and ampere tables are included. Wire and Cable Div., National Electric Products.

445 **Insulated Cable** — "How to choose insulated cable" is the subject of humorously illustrated 22-pp Bul-

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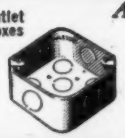
Outlet Boxes

Also Manufacturers of

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Automatic Reelites

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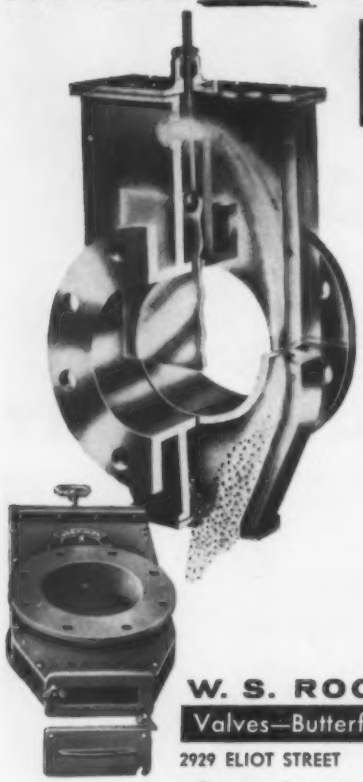

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SLIDE VALVES from the lines for cleaning

For fluids, air or gases containing solids or for free flowing granular materials that clog or jam conventional valves—Kwikleen is the answer.

It permits 100 per cent flow in full open position and quick shut-off manually or mechanically. Easily, quickly cleaned by removing bottom plates. The valve need not be removed from the line. Sediment drops out or can be blown or flushed out by air or water.

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- AMPLE STORAGE: Contains 63-ft. chart roll, or 31 days' recording at one inch per hour. Useful chart width 2 9/16".
- ACCURATE: Galvanometer pointer swings free for maximum accuracy, being clamped briefly for marking.
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- RECTILINEAR: Advanced design provides true rectilinear recording free from distortion.
- RELIABLE: Positive synchronous motor drive with sprocket engaging holes in paper for accurate time indication.
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WRITE TODAY FOR LITERATURE

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rust industrial co., inc.

130 Silver Street, Manchester, N. H.

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DATA FILE

(Begins on page 254)

letin 1117. Basic considerations to keep in mind when selecting insulated cable are stressed, and essential facts about construction components are presented. The Okonite Co.

446 **High-Voltage Cables** — Bulletin RCD 701 describes high-voltage power cables sheathed with neoprene for protection against corrosive and abrasive conditions. Advantages of this sheathing compound are detailed. Rome Cable Corp.

447 **Armored Cable** — Advantages, characteristics and construction of interlocked armored cable are detailed in this product bulletin. Types of insulation are described and illustrated. General Cable Corp.

448 **Cable Troughs** — This 12-pp catalog offers a simple solution to any design problem of change of direction or elevation with a complete set of standard fittings, horizontal elbows, inside and outside vertical elbows, ties, crosses, covers and many special devices. The Globe Co.

449 **Cable Supports**—This information folder contains data on company's cable supporting equipment, telling how to install cable supports, giving advantages of cable trough. T. J. Cope Div., Rome Cable Corp.

450 **Switch Wiring Diagrams**—Bulletin 709 is a 36-pp booklet of typical wiring diagrams for across-the-line starting switches. Indexed and arranged for easy use, this booklet serves as a guide to some of the many ways in which this company's manual and magnetic across-the-line starters are used. Allen-Bradley Co.

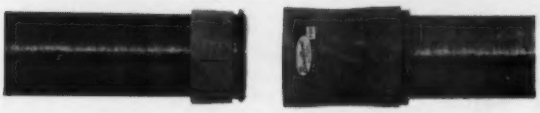
451 **Hydraulic-Magnetic Breakers**—Bulletin 301, 16 pp, describes advantages and operation of company's hydraulic-magnetic circuit breakers. Design and construction features are detailed and time-delay curves, specifications and dimensional data included. Heinemann Electric Co.

452 **Circuit Breakers** — Bulletin 5042-A deals with company's current limiting circuit breakers on low voltage systems, operational characteristic curves and ratings. A three-dimensional sectional view opens up to show internal construction details. I-T-E Circuit Breaker Co.

453 **Protective Relays**—Featured in 16-pp Catalog 5-020 are time delay overcurrent relays, directional inverse time overcurrent relays, differential relays, instantaneous overcurrent relays (adjustable setting), inverse time voltage relays, auxiliary relays, ac-dc definite time relays, and reclosing relays. For each model, tabular data and photos cover its applications. Federal Pacific Electric Co.

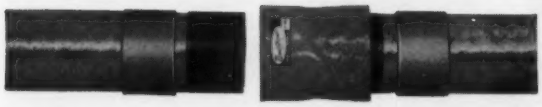
454 **Distribution Equipment** — Detailed information on company's line of electrical distribution equipment is

BONDSTRAND®



fiber-glass reinforced

epoxy pipe by Amercoat®



... strong as steel pipe, only one-eighth the weight. Tensile: hoop 80,000 psi, longitudinal 40,000. Highly corrosion resistant. Won't scale, cold flow or deform. 20-foot lengths easy to cut and join; threaded or locking wedge fittings.

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Sky-Blast weatherproof design is strictly functional and maintenance-free! This powerful industrial ventilator helps preserve roofs too, by shooting heat, fumes and oily mist high into air so they can't turn downward!

All-welded base of heavy gage steel is hot-dip galvanized *after fabrication* . . . has no seams that can open up or rust through. Fully enclosed weatherized R&M motor is completely protected against rust and corrosion. Rigid one-piece cast aluminum magnesium alloy airfoil propeller operates continuously without failure from bending fatigue. Reinforced damper blades won't stick . . . feature self-lubricating bronze bearings. Patented non-clogging rainshed design eliminates troublesome conventional drain trough. Deep inner throat drains condensate onto roof, not into building.

Sizes from 16" to 60" for 2820 to 78,800 CFM—PFMA Certified Ratings. Available with new patented Smoke-Trip® thermally actuated emergency damper release for fire protection.

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DIV. OF ROBBINS & MYERS, INC.
SPRINGFIELD, OHIO

Certified Ratings PFMA

MOVING AIR IS OUR BUSINESS®

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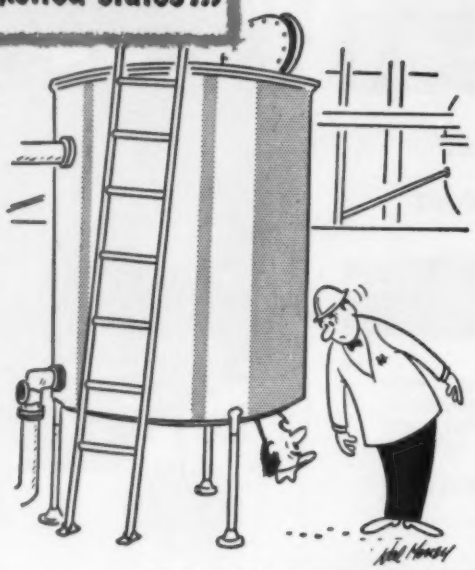
Life in these excited states...



"I think I've found the leak, chief!"

A safer way to stick your neck out

Good equipment costs so *little* more, it pays to stick your neck out and ask for it. If the boss is cost conscious you'll *get* it. He too knows the dollars lost by corrosion and contamination. You're always safe when you specify Ace piping, valves, pumps and tanks.

Ace chemical-resistant rubber-lined steel pipe best for high-pressure, big sizes, or abrasives. Pipe, fittings and valves 1½ to 24".

Highly efficient *WE* pump. Capacity to 360 gpm. Cast iron, fully protected by top quality, chemical resistant hard rubber lining.

Design assistance and facilities for molding special fittings, pump parts, etc., of plastics or hard rubber. Also large hand-fabricating facilities.

Variety and quality to match *any* plastic piping. Riviclor PVC, Ace-Ite rubber-plastic, Parian poly, Ace Saran, Tempron high temperature nitrile, hard rubber-lined steel.

ACE processing equipment of rubber and plastics

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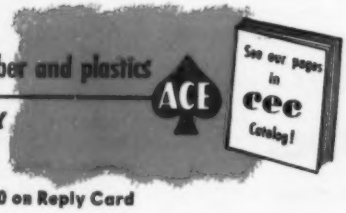

For more facts circle 690 on Reply Card

DATA FILE

(Begins on page 254)

presented in 82-pp '59 Marketeer, Catalog M-159. Among equipment described are Electrostrip multi-outlet assemblies, switches, lighting panelboards, power panelboards, switchgear assemblies, and various types of electrical duct. Tables of essential data. BullDog Electric Products Co., Div. I-T-E Circuit Breaker Co.

455 Portable Distribution System —Described in this 30-pp catalog is a portable distribution system for electric lighting and power, including such applications as portable lighting, heating and ventilation equipment, welding machines, power tools, and lighting transformers. System diagrams showing how each unit fits are included. Whitney Blake Co.

456 Electrical Equipment Digest—Electrical equipment illustrated and described in 160-pp Catalog Digest 142, includes load centers, circuit breakers, low voltage control, fusible service equipment and accessories, meter sockets and troughs, safety switches, panelboards, duct and fittings, starters. Square D Co.

457 Wiring Devices — Catalog 60, about 80 pp, presents ordering data on wiring devices including a wide range of switches, convenience outlets, lampholders, fluorescent devices, cord connectors, adapters, wall plates, accessories etc. Fully illustrated with photos, catalog provides condensed information on features, dimensions, applications. Pass & Seymour, Inc.

458 Fuses for All Uses—This revised edition of manufacturer's complete line, Folder 3, includes illustrations and descriptions of fuses for every purpose. Features dual-element cartridge fuses for time-lag in protection against overloads, and delay renewable fuses and renewal links. Economy Fuse & Mfg. Co.

459 Condulet Breathers, Drains — Bulletin 2702 describes condulet breathers and drains designed to remove moisture from electrical systems. Explains how breathers and drains add to life of explosion-proof equipment. Crouse-Hinds Co.

460 Battery Users Manual—Motive-power battery maintenance and repair is detailed in this newly revised edition of company's Battery Users Manual (Bulletin GB-1599A), 44 pp. Developed as a result of in-plant training courses, this book is designed to enable plant engineers to conduct an organized battery training course. Gould-National Batteries, Inc.

LIGHTING, COMMUNICATION

462 Architectural Floodlighting — Eight-pp Bulletin GEA-6437 illustrates various methods of floodlighting industrial plants, public and commercial buildings and others. Provides information on general purpose models. General Electric Co.

Steelcote

THROUGHOUT AMERICA PLANT MAINTENANCE MANAGERS CHOOSE

DAMP-TEX

WET WALL ENAMEL

TRANSFORMS WET, ROTTING WALLS TO SANITARY BEAUTY

SEND FOR DETAILS OF NO-RISK TRIAL OFFER: Prove Damp-Tex's superiority in your own plant.

This bactericide, fungicide system is a pioneer and leader in its field. Its efficient, durable performance in thousands of plants is your best guarantee of satisfaction.

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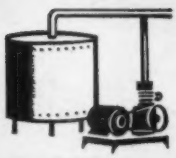
STOPS FLOOR DAMAGE FROM ALKALI, ACIDS AND HEAVY LOADS

SEND FOR NO-RISK TRIAL QUANTITY. Send for 26-lb. unit. Use half. If not satisfied return balance prepaid for credit on entire unit.



To Prevent Chemical and Water Corrosion of EQUIPMENT The Most Permanent Finish Is

EPO-LUX 100 (EPOXY)

Protects where chemical liquids or fumes eat up other type coatings. Dries to 75% hardness of glass yet resists chipping or cracking.

STEELCOTE MFG. CO. 3418 GRATIOT ST. ST. LOUIS 3, MO., U.S.A. RODNEY, ONTARIO, CANADA

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Modern compressed air users demand the

REVOLUTIONARY

Money Saving

Wilkerson

"MAINLINER"

AFTERDRYER SYSTEM

The greatest advancement since aftercoolers or desiccant filters.

● **LOW INITIAL COST**
Eliminates cooling towers, water filtration, pump, and expensive chemicals.

● **LOWEST INSTALLATION COST**
Eliminates water connections, valves, water or dust filters.

● **LOWEST OPERATING COST**
Eliminates expensive water and desiccant bills.

● **LOWEST MAINTENANCE COST**
Eliminates tube cleaning and periodic chemical changes.

MODEL 1114-16

BEFORE YOU BUY

an after cooler or chemical condenser WRITE TODAY for your copy of the Wilkerson bulletin entitled "**Afterdryer System versus AfterCooler or Dessicant Condensers**". This bulletin will give you all the facts on the revolutionary new Wilkerson Afterdryer System which makes use of the "Mainliner".

IT WILL SAVE MONEY.

WILKERSON CORPORATION® THE LEADING LINE OF AIR LINE PRODUCTS

"Dedicated to keeping the NEW in PNEUmatics" 1638 West Girard, Englewood, Colo.

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BOWSER

PORTABLE WHEEL TANK

TRANSPORTS LIQUIDS . . . . QUICKLY . . . . SAFELY

FIGURE 121

DISPENSES AND REGISTERS Gallons, ½ Gallons, Quarts, Pints

Oils, solvents, process liquids . . . are all transported quickly, easily, safely . . . and dispensed accurately in controlled quantities. A piston-type measuring pump with counter records up to ten gallons and repeats or resets. Protecto-Seal fill-and-vent with built-in flame arrestor assures safe handling of flammable liquids. Anti-drip nozzle. 50-gallon tank. Convenient delivery hose.

ALSO AVAILABLE . . .

Figure 63	Figure 172	Figure 41	Figure 109
Measures quart, pint, or ½-pint. Anti-drip nozzle. Pump is lockable. 65-gal. tank.	Completely enclosed. Hinged, lockable cover. Same pump and tank as Figure 63.	Floor stand pump for low-level tanks. Measures gals., ½ gals., qts., pints. Lockable.	Dispenses and records gal., ½ gal., qt. and pt. quantities. 65 or 120-gal. tank.

BOWSER, Inc., 1381 EAST CREIGHTON AVENUE FORT WAYNE, INDIANA

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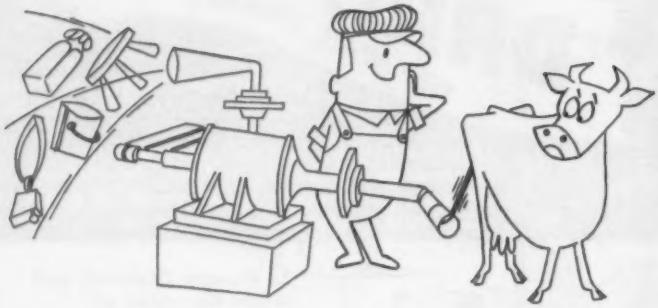
WEMCO® the INCREDIBLE Torque-Flow Pump

pumps almost everything
(what will go in will come out)



secret: recessed impeller; continuous open passage
(with downtime virtually eliminated)

Western Machinery Company 650 Fifth Street • San Francisco, Calif.

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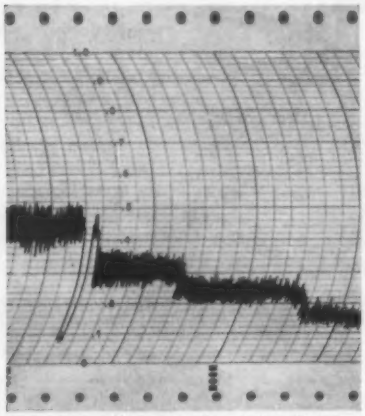
RECORDERS WORK... *WHILE YOU ARE BUSY ELSEWHERE*



Courtesy Nuclear Measurements Corp., Indianapolis, Indiana

This record was made by a DC Milliammeter in a monitoring unit, measuring fall-out over Indianapolis after the explosion of an experimental bomb.

The recorder was on the job continuously for 1½ days before fall-out began to increase as shown here. Meanwhile the technicians and engineers were busy at other tasks.

Make recording instruments help you multiply your effectiveness. Ask for Catalog 657.

Product Representatives in Most Principal Cities

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Pioneers in the Manufacture of Graphic Instruments
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DATA FILE

(Begins on page 254)

463 Vaportight Fixture—Twenty-pp Bulletin 5-A covers a line of convertible, vaportight lighting fixtures designed especially for use with heavy-wall, rigid conduit in areas where vapor and heavy-air create lighting problems. Complete description and dimensional data are included. Appleton Electric Co.

464 Lighting Fixtures—This 12-pp condensed catalog gives a compact presentation of company's fluorescent and Brascolite incandescent luminaries. Data on surface and pendant mounted units, recessed luminaries, and Gratelite electric ceilings provided. Edwin F. Guth Co.

465 Lighting Maintenance Tips — Principles and advantages of good lighting practice are presented in this 48-pp lighting maintenance manual. Much useful information has been added to this revised edition, including a guide to trouble shooting fluorescent installations, a section on planning group replacement of lamps, cleaning. Champion Lamp Works.

466 Communication System—Featured in this bulletin is a transistorized communication system designed to provide communication between two or more persons or departments regardless of distance or surrounding noise conditions. Operating and equipment features are detailed. Gai-Tronics Corp.

PLASTICS, SYNTHETICS

467 Guide to Plastics—This 64-pp catalog contains detailed information on plastic sheets, rods, tubes, films and lay-flat tubings. Cements, pigments and miscellaneous supplies are also listed. Among data furnished are sizes, weights, color ranges, textures, specifications, grades and prices. Includes comparison tables giving chemical, electrical and mechanical properties of many plastics. Cadillac Plastic & Chemical Co.

468 Silicone Rubber — Advantages offered by silicone rubber cable and wire are detailed in 8-pp Bulletin SR-58-5M. Properties of silicone rubber insulated wires and cables are described, as well as applications and construction, and tables of engineering data are included. Rockbestos Products Corp.

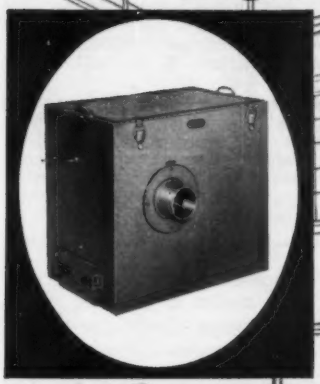
469 Thermoplastic Polymer — Information on the properties of Penton, thermoplastic polymer, is presented in this 6-pp brochure. Lists mechanical, electrical and chemical properties and describes molding methods. Hercules Powder Co.

SAFETY, SANITATION

471 Safety Equipment — Featured in 28-pp Catalog 58 is a line of industrial safety equipment, including head protection, first aid, respiratory equipment, materials handling equip-

DUSTKOP "520"

designed to collect dust from single machines



portable—easily installed

DUSTKOP STOPS DUST

Self-contained Dustkop models like the "520," are practical and effective in collecting dust from single machines. They're designed specifically for service with surface grinders, tool and cutter grinders, offhand grinders, buffers and other small wheel equipment. These units are also easy to install — are actually portable — and very economical to operate.

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46 models to choose from!

NEW DUSTKOP AUTO SHAKER shakes filters AUTOMATICALLY

AGET manufacturing company
1388 E. Church Street, Adrian, Michigan

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Now find cracks, leaks defects--quickly, easily

ZYGLO®

BLACK LIGHT Portable Inspection Kit

EASY TO USE
- in the shop
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FOOLPROOF FLUORESCENT PENETRANT INSPECTION

FIRE SAFE
New, improved high flash-point materials. Packed in push-button spray cans.

IDEAL FOR
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- Maintenance Inspection
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Genuine ZYGLO KIT complete with 100 W. BLACK LIGHT **$125.00** F.O.B. CHICAGO

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Please send _____ ZYGLO Kit(s) @ $125.00 each.

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The Image of CF&I offers Safe, fast materials handling with

Coburn Overhead Conveying Systems

The CF&I Image stands for the quality of all CF&I steel products made for general industry. For materials handling, he offers Coburn Overhead Conveying Systems because they speed up the spotting of work over machines . . . help eliminate damaged goods resulting from multiple handling. Coburn systems are made from high quality steel, yet they are inexpensive as the sectional design can be adapted to any plant.

There's no installation problem. In fact, the design is so simple and practical that your own plant personnel can install the Coburn system.

CF&I-Coburn also makes a full line of sliding door and fire door hardware. For complete information on these CF&I products, write to Coburn Sales and Engineering, P. O. Box 311, Palmer, Mass.

6604

CF&I STEEL

COBURN PRODUCTS
THE COLORADO FUEL AND IRON CORPORATION
WICKWIRE SPENCER STEEL DIVISION

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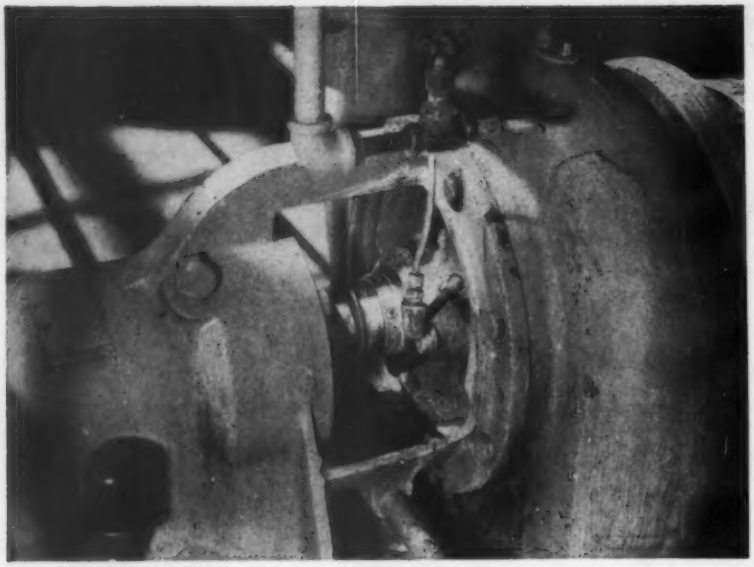

CHEMPRO MECHANICAL SEAL "HOLDS THE LINE" AGAINST 560,000,000 GALLONS OF ORANGE JUICE CONCENTRATE

In September, 1956, CHEMPRO MECHANICAL SEALS* were installed in 4 Allis-Chalmers high speed pumps located at the Minute Maid processing plant in Leesburg, Florida. The pumps recirculate orange juice through evaporators used to produce frozen orange concentrate.

So far, each pump and SEAL has handled approximately 560,000,000** gallons of concentrate. This service is so tough that most other previously used packings and seals needed frequent replacement. The original CHEMPRO MECHANICAL SEALS are still in operation *and there has been no leakage whatsoever in any of the pumps.*

*CHEMPRO MECHANICAL SEAL, Size 250 WLC, quenched, 316 stainless steel with Carbon vs. Ceramic Seal Faces.

**Pump handles 2,000 gal. of concentrate per minute and runs 24 hours per day, 7 days per week, for 7 to 8 months each year.

For information on CHEMPRO MECHANICAL SEALS IN TOUGH SERVICE, WRITE FOR BULLETINS CP-551 and 575.

CHEMICAL & POWER PRODUCTS, INC.

The Original Fabricators of Teflon Packings and Gaskets

7 Broadway, New York 4, N.Y.

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DATA FILE

(Begins on page 254)

ment, and miscellaneous items. Includes descriptive details, illustrations, and complete specifications and dimensional data. E. D. Bullard Co.

472 Industrial Soaps—Featured in this product bulletin are three skin cleaners designed for use in industrial plants. A fine granulated cleanser, a heavy duty type, and an extra fine granulated cleanser are covered. Sugar Beet Products Co.

Postage-free Reader Service Cards make it easy to order catalogs. Cards are provided on pages 249 and 250.

473 Fire-Resistant Fluids — This series of specification sheets describes company's line of fire-resistant fluids, including synthetic, oil-water emulsion, and glycol types. Physical characteristics and other data on each included. Socony Mobil Co., Inc.

474 Insect Control — Featuring manufacturer's insecticides and insect control equipment, this practical 36-pp booklet provides excellent tips on the control of industrial insects. More than 60 pests are pictured along with specific information on where they are found, identifying features, extent of damage, life stages and cycles, characteristics of existence. West Chemical Products, Inc.

OTHER EQUIPMENT

475 Industrial Finishing Equipment—Catalog A 657, 12 pp, describes modern finishing system for cleaning, rust proofing, drying, painting and finish baking. The R. C. Mahon Co.

476 Preheating Combustion Air—This well-illustrated 36-pp booklet explains fuel savings and increased performance made possible by using waste heat in flue gases to preheat incoming combustion air. Also covers increased boiler output, ability to use lower grade fuels effectively. Air Preheater Corp.

477 Release Agent—Technical Bulletin 19 describes a release agent which can be rubbed to an imperceptible film for easy parting of epoxy resin castings from plaster molds, or from metal, wood, or epoxy masters. Covers methods of applying and includes prices. Smooth-On Mfg. Co.

478 For Cleaner Furnace—The use and application of Oxi Crystals to keep furnaces and the fireside of boilers free of slag, encrusted carbon, soot and fire-scale is described in a recent pamphlet. Oxi Corp.

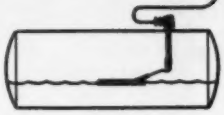
480 Equipment Selector Charts—Bulletin CE-50, 20 pp contains selector charts on corrosion-resistant equipment for process industries.

100% AUTOMATIC TANK GAUGING

Dependable remote reading tank contents gauges using a closed hydraulic transmission system. No power required.

Several sizes available. Approved by Underwriters Laboratories and Factory Mutual. UL approved switches.

Write for complete details, to Dept. B



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THE LIQUIDOMETER CORP.
LONG ISLAND CITY 1, NEW YORK

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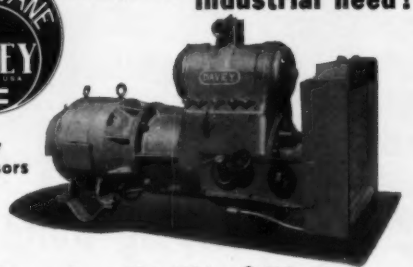
HYDROVANE DAVEY

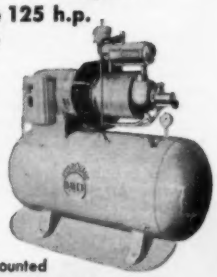
NEW... **meets every industrial need!**



Rotary Compressors

Stationary units . . . 20 to 125 h.p. @ 125 p.s.i.

- ✓ **Silent . . . vibrationless . . . compact**
- ✓ **Complete line . . . 2 to 125 h.p. . . . 8 to 500 c.f.m. @ 125 p.s.i.**
- ✓ **No complicated engineering . . . no compressor room . . . no foundation**
- ✓ **Easy to install and operate**
- ✓ **Air cooled or water cooled**



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Tank mounted 2 to 5 h.p. @ 100-200 p.s.i.

INDUSTRIAL DIVISION

DAVEY pioneers of "air-cooled air"

DAVEY COMPRESSOR CO.
Kent, Ohio

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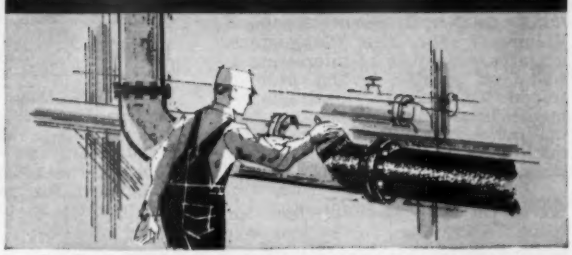
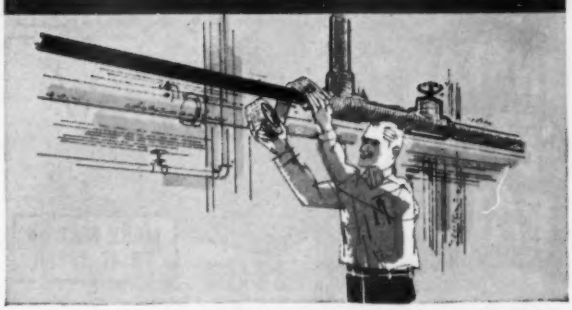
Industrial plants know Mortell products offer more positive protection than any other drip-and-rust preventive. Maintenance men know that paints or compounds of paint and fish oil provide little or no permanent protection. Rust-inhibiting NoDrip Plastic Coating is a moisture-proof insulation that *does* stop condensation . . . forms a seamless jacket . . . *does* stop corrosion. NoDrip Tape, with its triple insulating barrier, is equally dependable.



For Tanks, Large Pipes, Air Ducts, Metal Equipment, Walls, Ceilings, Permanently End Condensation Drip, Rust and Corrosion With NoDRIP PLASTIC COATING

The heavy consistency of NoDrip outlasts many coats of paint or ordinary rust-preventives. Permanently insulates and protects. Applies easily with trowel, brush or special spray. Nontoxic, odorless and non-flammable. Resists acid, alkali, brine solutions or vapors. Available in 1, 5 and 55 gallon drums.



For Smaller Pipes or Tubing, Permanently End Condensation Drip, Rust and Corrosion With NoDRIP TAPE

An easy-to-use, wrap-around pipe covering, perfectly pliable, cork-filled, completely self-adhering. Forms an air-tight, 100% vapor- and moisture-proof jacket. Fits snugly even around tees, unions, angles, valves. Cuts maintenance costs—makes out-of-the-way storage areas useable—ends slip and slide floor hazards. No need for vapor seals, brads, fasteners or tools of any kind.

At all leading hardware, mill supply and plumbing jobbers. For complete information and technical handbook, write

JW Mortell COMPANY
597 Burch Street · Kankakee, Illinois

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DATA FILE

(Begins on page 254)

Tables cover general considerations in selection of material, physical properties, corrosion resistance, techniques and skill in manufacture of equipment. Describes rubber and plastic pipe, tubing and fittings; valves; pumps. Amerace Corp., American Hard Rubber Div.

481 Flexible Air Duct — Described in this product bulletin are a variety of applications for flexible air duct, ranging from cooling ducts on electronic instruments to exhaust ducts on machine tools. The Wiremold Co.

482 On Non-Destructive Testing — Volume 7, No. 1 of "Magnafacts" contains a number of interesting articles on specific testing problems solved with company's testing instruments. In all the articles, advantages of increased economy, consistent quality and increased safety are stressed. Magnaflux Corp.

484 On Wire Cloth—"Which Inco Nickel Alloy Can Solve Your Wire Cloth Problem?" 16 pp, cites 23 case histories showing where use of Inco nickel alloys in wire cloth improved service at lowered cost. Lists standard weaves, more than 150 chemicals filtered with it, mechanical properties, physical constants. Buyer's guide of established weavers included. The International Nickel Co., Inc.

483 Fluid Mixers—Advantages and mechanical features of company's industrial mixers designed for a variety of fluid mixing operations are detailed in a series of bulletins available in this ring-bound notebook, containing Bulletins B-102, 103, 104, 108 and 111. Selection tables, outline dimensions and photos of typical applications are included, as well as specifications, mixer capacity tables, photos. Mixing Equipment Co., Inc.

485 Guide to Shelving—To assist plant engineers in selecting proper shelving for all storage requirements, 64-pp Catalog 30 offers detailed suggestions for correct shelving and storing materials, loose and packed parts, record files. Shop equipment and storage cabinets are also described, and instructions included for planning of stockrooms. Deluxe Metal Furniture Co. Royal Metal Mfg. Co.

486 Plumbing, Heating Supplies—Edition H is the current edition of this company's 126-pp general catalog on plumbing and heating repair parts, tools and accessories. Indexed and illustrated, the catalog gives detailed information on uses. J. A. Sexauer Mfg. Co., Inc.

487 Turbine Oil Conditioning — Bulletin 832-P, 12 pp, describes a dry type turbine oil conditioner designed to prevent action of air, heat, water, metals and foreign matter on turbine oil. Diagrams and text explain how turbine oil conditioning systems operate. Bowser, Inc.

488 Classifying Systems—This bulletin covers major advantages, industrial applications and design features of high efficiency classifying systems for efficient separation or dedusting of dry powdered materials. Includes details on operation, flexibility. Buell Engineering Co., Inc.

489 Water-Cooled Stoker — Design and operating advantages of the Vibra-grate Stoker are outlined in this illustrated bulletin. A large cutaway view details component parts of the stoker. American Engineering Co.

490 Heat Exchange Surface—Advantages and applications of Thermo-Panel Coil—a plate coil heat exchange surface that takes the place of pipe coils in industrial heating and cooling process—are described in Bulletin 257. Dean Thermo-Panel Coil Div., Dean Products, Inc.

491 Cooling Towers — **Featured** in 20-pp Catalog DFA-58 is company's double flow Aquatower, combining high efficiency with low silhouette. Specifications and engineering data are included, as well as dimensional drawings. The Marley Co.

492 Heat Exchangers—General information and selection data on company's line of heat exchangers designed for heating liquids with steam is presented in 12-pp Bulletin GN-1054. Applications are illustrated and described, and tables of ratings and dimensions given. Bell & Gossett Co.

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Repair broken factory floors without the usual traffic tie-up. Simply shovel INSTANT-USE into hole or rut—tamp smooth—truck over! No waiting! INSTANT-USE bonds tight to old concrete—right up to a feather edge. It's tough. Wears like iron. Won't crack or crumble. Install complete overlay where floors are badly chewed up. Used indoors or out. Immediate shipment.

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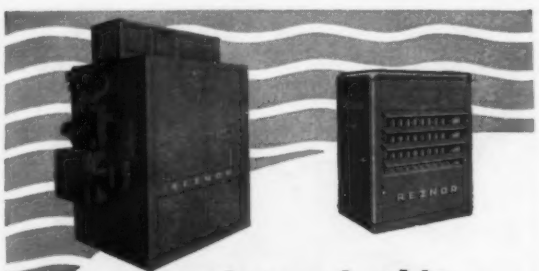

heat outlying buildings

There's a practical limit to what you can do with a steam heating system. New plant additions may run your heating requirements above the capacity of your boilers. Or outlying buildings such as guard houses, garages or storage buildings may be beyond the economical reach of your steam lines.

But there's no limit to what you can do with Reznor gas unit heaters. Wherever and whenever heat is needed, it's a simple, inexpensive job to install the Reznor units which will produce and distribute the necessary heat right at the point of need . . . instantly and automatically. For complete details on how Reznor can help you solve your plant heating problems, just give your Reznor distributor a call or write for your free copy of "Modern Heating"

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How Ni-Rod "55" builds up worn cast iron... keeps repair cost down

When the owners of the M V Sunprincess heard it would cost them over $7,200 to replace all six worn ship pistons, they quickly called in J & R Weir Ltd., Marine Engineers, Montreal.

These engineers in turn recommended a Ni-Rod "55"* repair job — welding to be done by Welding Engineers Ltd., Montreal.

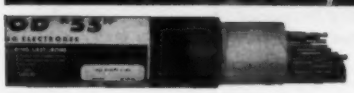
Wear ran as high as ⅛ inch on some of the piston ring grooves. But with Ni-Rod "55" Electrodes, weldors soon had all six pistons back in the ship at a total cost of $2,450 — a saving of over $4,750.

For your jobs

Ni-Rod "55" can be used to build up worn areas in almost all cast iron parts. Auto, truck, or ship pistons . . . valve seats . . . cylinder walls . . . are just a few. And the cost is just a fraction of what replacement would cost. What's more, with Ni-Rod "55", the repair is done quickly and easily. Welds are strong, sound, highly machinable.

Write for "Repair Cast Iron Parts Quickly and Easily" for the complete Ni-Rod "55" story. *Registered trademark

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street — New York 5, N. Y.



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Save ✓ STORAGE SPACE ✓ LABOR COSTS

Trojan Folding Aluminum Sawhorse Legs and Leg Extensions are adaptable for many uses throughout the factory, maintenance department, service trucks, and erection crews.

Trojan horses are strong and rigid and tested by the Pittsburgh Testing Laboratories up to 2,000 pounds with leg extensions attached. Trojan Sawhorse Legs are made of heavy gauge aluminum. Top locking assembly parts are steel. Total weight per pair, five pounds.

Horses can be raised to 30 inches or higher by using leg extensions. Ideal for counters, work benches, scaffolding platforms, etc. When not in use horses may be stored into a compact unit by loosening handles, removing board and folding up legs. Especially convenient to carry on service or erection trucks. Your men can now have the much needed sawhorses that heretofore have been impossible on account of the bulk of wooden horses.

WRITE FOR FURTHER INFORMATION

TROJAN PRODUCTS CORPORATION
Department H, 1131 East 25th Street
INDIANAPOLIS 5, INDIANA

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Regardless of what you burn: petroleum pitch or other residual oils, coal tar, diesel oil or any grade of fuel oil . . . KOR is your economical short cut to better combustion.

KOR . . . the perfect alkaline fuel oil conditioner . . . completely dissolves sludge, keeps it suspended in solution with the fuel.

KOR cuts fuel costs because it activates all the BTU's in the sludge and oil.

KOR keeps entire fuel systems clean, eliminates soot and carbon scale, minimizes cleaning.

Safe, Easy To Use, Economical *Ask for Literature*

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GARY, INDIANA

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Far More for My Money
when I bought this terrific new
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Pipe & Bolt Threading Machine

Pats. Pending

Complete with 1 Universal Die Head, 2 Sets of Dies for ½" to 2" pipe or conduit

Looks good, does better. Perfect cutting, reaming, threading fast . . . and easy! Three tools operate independently . . . swing up out of the way for short pipe chucking from front. Slip-proof Speed Chuck is a great performer. Concealed oil system, automatic shut-off nozzle. Quick-opening die head sets to size right in machine. Power?. . . RIDGID-built motor handles 2" pipe, conduit, bolt, rod—and 12" geared tools easily. Try it, compare it . . . and you'll understand its enormous popularity! Leg and wheel stands available. At your Supply House.

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THREADED PIPE . . . It's Tight . . . It's Best . . . Costs Less!

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For the complete story behind the toughest industrial flooring made, write today for Bulletin 659. It's free.

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"America's Leading Industrial Flooring Specialists"

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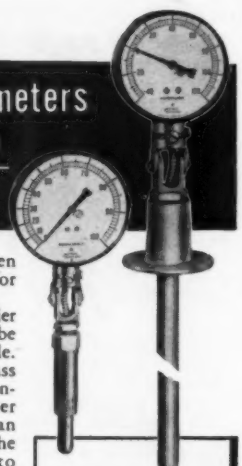
New!

Marsh Dial Thermometers *designed expressly* for piping and ducts



Here you have everything that has been so long needed in thermometers for piping and duct work.

Big 3½" and 4½" dials are far easier to read; still more important, can be turned and tilted to *any* reading angle.

Instead of illegible, breakable glass tube, you now have the readable, unbreakable Marsh—the thermometer that gives greater *readable* accuracy than any glass tube thermometer and has the famous Marsh "Recalibrator" to *keep* it accurate.

Complete line provides for every service. Separable sockets and swivel attachment nuts make connecting and disconnecting easy. Extension necks provide for insulated piping and ducts.

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Ranges: 0°—100° F, 20°—120° F, 40°—240° F and 100°—300° F. ¼" NPT male connection.

FOR DUCTS
Ranges: minus 40°—120° F, 0°—160° F, 0°—220° F. Long stems extend into ducts for accurate indication.

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New bulletin covers interesting details

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Dept. W, Skokie, Illinois

MARSH

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Aget Manufacturing Co. 275
Airtemp Div. Chrysler Corp. 76
Alan Wood Steel Co. 164
Allen-Bradley Company 195-196
Aluminum Company of America 67, 75, 211
Amerace Corporation
American Hard Rubber Div. 272
Amercoat Corporation 271
American Bridge Division
United States Steel Corp. 69
American Chain & Cable Co.
Wright Hoist Division 163
American Machine and Metals, Inc. 209
American Standard Industrial Div. 14-15
Appleton Electric Company 269
Armco Drainage & Metal Products 86
Armstrong Machine Works 227
Azrock Floor Products Div. 233

Barber-Colman Company 246
Bell & Gossett Company 63
Betz Laboratories, Inc. 37
Black & Decker Mfg. Co. 87, 271
Blaw-Knox Company 178
Borg-Warner Mechanical Seals 50
Bowser, Inc. 273
Buell Engr. Company 194
Buffalo Forge Company 20
Bullard Company, E. D. 220
Bulldog Electric Products Co. 147, 149, 151
Butler Manufacturing Co. 40-41, 266

Cadillac Plastic & Chemical Co. 181
Champion Lamp Works 197
Chemical & Power Products, Inc. 276
Chemplast, Inc. 186
Clarage Fan Company 239
Climax Molybdenum Co. ..... Back Cover
Colorado Fuel & Iron Corp. 275
Columbus McKinnon Chain Corp. 38
Combustion Engineering, Inc. 59
Connor Engineering Corp. 182
Crane Company 171
Crouse-Hinds Company 43
Cullen-Friestedt, Inc. 267
Curtis Mfg. Company 234

Darling Valve & Mfg. Co. 238
Davey Compressor Company 277
Day Company 48, 49
Dean Thermo-Panel Coil Div. 262
Dearborn Chemical Company 21
De Bothezat Fan Division
American Machine and Metals, Inc. 209
Diamond Chain Company 173
Dodge Corporation, F. W. 259
Dodge Mfg. Corporation 174, 175
Dorr-Oliver, Inc. 200
Douglas Fir Plywood Assn. 32
Dracco Div. of Fuller Co. 217
Dravo Corporation 265
Du Pont de Nemours & Co., E. I. 143, 180

Economy Fuse & Mfg. Co. 199
Edwards Company 247
Electric Controller & Mfg. Co. ..... 3rd Cover
Essex Conveyors, Inc. 263
Esso Standard Oil Co. 207
Esterline-Augus Co., Inc. 274

Falk Corporation 221
Faultless Caster Corporation 230
Federal Pacific Electric Co. 245
Feedrail Corporation 192
Fiske Bros. Refining Co. 36
Flexonics Corporation 237
Flexrock Corporation 278
Foster Company, L. B. 264

Gal-Tronics Corporation 176
Gardner-Denver Company 77
Garlock Packing Company 235
Gast Mfg. Corporation 267
General Cable Corporation 34-35
General Electric Company
Apparatus Division 47, 145, 167, 223, 260
Lamp Division 61
General Radio Company 158
Georgia-Pacific Corporation 205
Globe Company
Products Division 242
Goodyear Tire & Rubber Co., Inc. 1
Gould-National Batteries, Inc. 17
Gould Pumps, Inc. 74
Graybar Electric Company 157
Grinnell Company 5
Gulf Oil Corporation 152-153
Guth Company, Edwin F. 71

Hagan Chemicals & Controls, Inc. 261
Heinemann Electric Company 68
Homestead Valve Mfg. Co. 255

ILG Electric Ventilating Co. 52-53
Ingersoll Rand Company 248
Inland Steel Company 166
International Nickel Co., Inc. 279
Invincible Vacuum Cleaner Mfg. Co. 212
ITE Circuit Breaker Co. 72-73
Small Air Division 55

Jeffrey Mfg. Company 24
Jenkins Bros. 51
Jenn-Air Products Co. 183
Johns-Manville 65, 159
Jordan Corporation 264
Joy Manufacturing Company 29

Kerrigan Iron Works, Inc. 268
Koppers Company, Inc. 264
KOR Corporation 279

Lennox Industries, Inc. 258
Leschen Wire Rope Div.
H. K. Porter Co., Inc. 206
Link-Belt Company 25
Liquidometer Corporation 277
Logansport Machine Co., Inc. 222
Louis-Allis Company 12-13
Lubriplate Division
Fiske Bros. Refining Co. 36

Magnaflux Corporation 275
Maguire Company, Walter 280
Mahon Company, The R. C. 45
Marley Company 210
Marsh Instrument Co. 280
Minneapolis-Honeywell 58
Mississippi Glass Company 66
Mixing Equipment Co., Inc. 188
Molded Fiber Glass Tray Co. 204
Mortell Company, J. W. 277
Mueller Brass Company 218

Natco Corporation 3
National Lighting Bureau 187
New York Blower Company 236

Otis Elevator Company 168-169

Page Fence Association 266
Pangborn Corporation 202
Partlow Corporation 191
Pass & Seymour 228
Pittsburgh Coke & Chemical Co. 33
Pittsburgh Corning Corp. 154, 243
Pittsburgh Screw & Bolt Corp. 263
Porter Company, Inc., H. K.
Leschen Wire Rope Div. 206
Powell Company, William 240
Propellair Division
Robbins & Myers, Inc. 271
Puritan Chemical Company 219
Purolator Products, Inc. 26

Ramset Fastening System 70
Remington Arms Company, Inc. 241
Reynolds Metals Company 22-23
Reznor Manufacturing Co. 278
Richards-Wilcox Mfg. Co. 201
Ridge Tool Company 280
Robbins & Myers, Inc.
Industrial Motors 54
Rockbestos Products Corp. 160-161
Rockwell Company, W. S. 270
Rohm & Haas Company 88
Rome Cable Corporation 141
Roura Iron Works, Inc. 244
Rust Industrial Company 270
Rusticide Products Company 46
Rust-Oleum Corporation 18-19
Ryerson & Son, Inc., Joseph T. 282

Sarco Company, Inc. 10-11
Sauer Mfg. Co., J. A. 260
Shamban Company, W. S. 215
Sinclair Refining Company 189
SKF Industries 16
Skil Corporation 30-31
Sly Mfg. Co., W. W. 64
Snap-on Tools Corp. 224
Smooth-on Mfg. Company 229
Socony Mobil Oil Company 56-57
Spencer Turbine Company 184
Square D Company ..... 2nd Cover
Standard Oil Co. (Indiana) 85
Steelcote Mfg. Company 273
Stephens-Adamson Mfg. Co. 262
Subox, Inc. 198
Sugar Beet Products Co. 190
Sun Oil Company 177
Sutorbilt Corporation 214

Tennant Company, G. H. 216
Texas Company 8-9, 213
Thomas Flexible Coupling Co. 4
Titusville Iron Works Co. 257
Trojan Products Corp. 279

Union Asbestos & Rubber Co. 244
Union Metal Mfg. Co. 208
United States Gauge 225
United States Steel Corp. 69, 155
U. S. Stoneware 39

Veeder Root, Inc. 179
Vogt Machine Co., Henry 193
Viking Pump Company 268

West Chemical Products, Inc. 165
Western Machinery Company 274
Westinghouse Electric Corp. ..... 6-7, 81 thru 84, 231-232, 253
Whitney Blake Co. 185
Whitney Chain Company 156
Wickwire Spencer Steel Div. of CF&I 275
Wiegand Company, Edwin L. 162
Wilkerson Corporation 273
Wiremold Company 246
Wright Hoist Division
American Chain & Cable Co. 163

Yarnall-Waring Company 78

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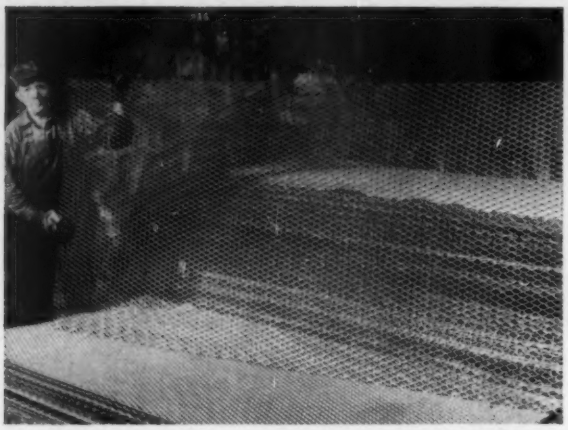

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STAINLESS PIPE & TUBING and fittings as well, are on hand in a complete range of types—304, 316 and 304-L for welding applications involving severe corrosion, and in a full range of sizes including schedules 5, 10, 40 and 80. Valves and welding and screwed type fittings also available.

Every kind... quick shipment

Whether you're up against an emergency or a routine need for steel, call Ryerson. You'll get what you want when you want it.

Steel of every kind and shape and size is available at Ryerson, from the world's largest stocks. It's ready for shipment fast—selected, checked and dispatched by an organization with over 115 years of metal distribution experience. And Ryerson is ready to help with steel selection, application suggestions, and scheduling. Ryerson steel and Ryerson service are as near to you as your telephone.

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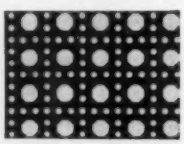
WELDED GRATING for strong, durable open steel flooring is available from Ryerson with all necessary cut-outs and banding. Comes painted or galvanized.



PERFORATED SHEETS for immediate shipment in standard patterns. Other patterns perforated to order from carbon steel and stainless sheets and plates.

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Member of the INLAND® Steel Family

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GIVES Certified

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A DIVISION OF THE SQUARE D COMPANY

CLEVELAND 28 • OHIO

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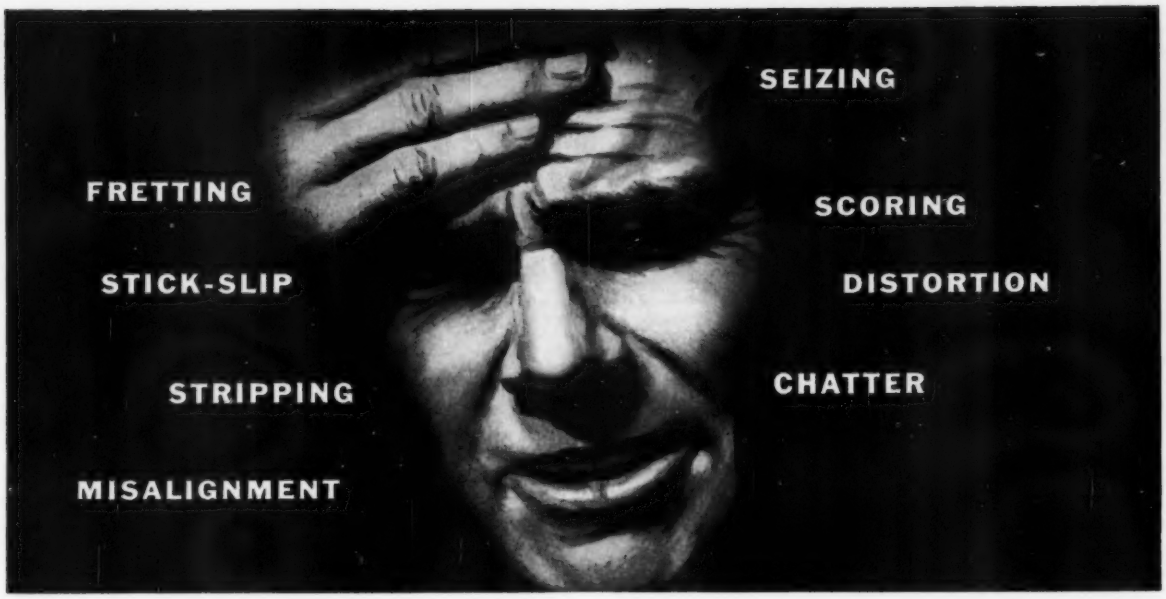

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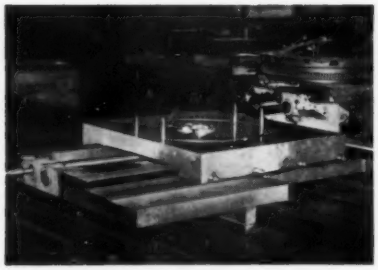
Four main properties of Molysulfide explain why it is so effective: (1) It is as slippery as ice. (2) Resists excessive pressures. (3) Lubricates over a wide temperature range −275°F to 850°F. (4) Sticks "like glue" to metal.

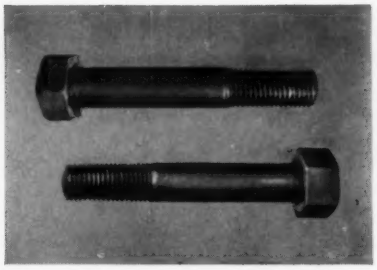
No other known substance equals Molysulfide heavy-duty lubricant as an immediate cure for galling and seizing of threaded connections . . . scoring and distortion of press fits . . . stick-slip or chatter on machine ways . . . fretting on splines . . . or for similar troubles involving gears, cams, collets and chucks.

Which lube headache can it solve for you? You can discover in virtually a single application.

Order a pound of Molysulfide, in either powder or concentrated grease form, from any one of the manufacturers below.



No slip-stick action at low speeds on machine tools gibs and ways when they're greased occasionally with Molysulfide heavy-duty lubricant.



No seizing. Service dismantling of powerhouse generator reveals bolts in top condition 21 months after Molysulfide lubrication.

Press fitting without galling. Both assembly and disassembly of locomotive drive journal go smoothly when Molysulfide lubricant is used.

CLIMAX MOLYBDENUM

Heavy-duty lubricants containing Molysulfide are now available nationally. Order from any of these well-known manufacturers:

Acheson Colloids Co., Port Huron, Michigan • The Alpha Molykote Corp., 15 Harvard Ave., Stamford, Connecticut • Basco, Inc., 730 W. Jackson St., P.O. Box 461, Milwaukee 1, Wisconsin • Bel-Ray Co., Green Village Rd., Madison, New Jersey • Bemol, Inc., 131 State St., Boston 9, Massachusetts • Fiske Bros. Refining Co., 1500 Oakdale Ave., Toledo, Ohio • Jet Lube, Inc., 3093 N. California St., Burbank, California • McGee Chemical Co., 8000 West Chester Pike, Upper Darby, Pennsylvania

For more facts circle 713 on Reply Card

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Plant Engineering

IN THIS ISSUE

Economics of Motor Power Factor 94
Ideas for Low Cost Buildings 96
Just 90 Days From Burn-Out to Production 100
Don't Let Rust Ruin Your Spare Maintenance Parts 101
When and If Computers Run Your Plant—
What About Plant Engineering and Maintenance? 105
Bolting Can Make Structures Better Than New 108
How Maintenance Studies
Can Decrease Machine Downtime 110
Boiler Feedwater Deposits—
Why They Form and What To Do About Them 112
Oven Space Problem Solved 114
Welding Repairs Big Hole 117
These Ovens Do Double Duty 118
New Side Stream Filtration of Boiler Water 119
Need Increased Capacity? Try Rebuilding Equipment 123
Explosive Forming, Slicing and Extruding 124
Properly Applied Insulation Saves Heat and Dollars 128
Dry Collector Cuts Costs 130
Microfilm—An Engineering Tool 132
Troubleshooting Reversing Contactors
II. Pinpointing Circuit Failures 134
Right Place, Right Part, Right Worker—
New MH Concept Brings 'em Together 136
AIPE Adds New Chapters 140

REGULAR DEPARTMENTS

'Round About With the Editors 2
Bulletins and Catalogs 21
Backtalk and Forethoughts 30
Plant Engineers' Digest 40
Operation and Production 56
Court Decisions 83
What's Just Ahead in This Issue? 93
News from the Plants 144
New Plant Construction 150
New Products and Processes 168
Review of New Books 232
Data File of Commercial Literature 240
Advertisers' Index 267

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